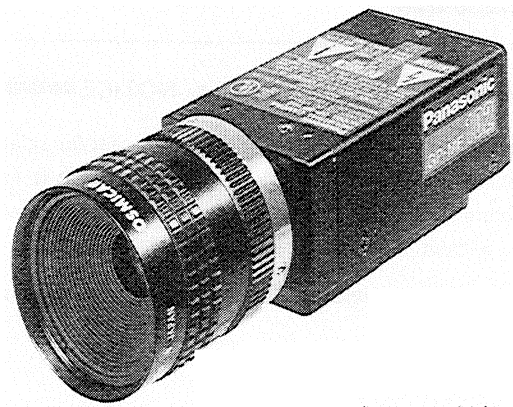
VIDE-V27693
ORDER NO AVS9212621C1
D0

Service Manual

Industrial Camera

GP-MF102



(Lens : option)

SPECIFICATIONS

Pick-up Device :	Internal Transfer CCD with 512 (H) × 492 (V) pixels
Image Size :	1/3" (3 64 (H) × 4 82 (V) mm)
Scanning :	2 : 1 Interlace
Synchronization :	Internal or External, switchable automatically Internal : Built-in sync generator External : 4 0 Vp-p/75 ohm HD and VD Built-in 75 ohms On/Off Switch
Resolution :	380 lines at center
Signal to Noise Ratio :	50 dB at AGC OFF, GAMMA 1
Minimum Illumination :	0 3 footcandle (3 lux) at F1 4, AGC OFF and Gamma OFF 0 05 footcandle (0 5 lux) at F1 4, AGC ON and Gamma OFF
Gamma :	0 6 or 1 (Selectable by internal switch)
AGC :	ON (+12 dB) or OFF (Selectable by internal switch)
Lens Mount :	C-mount
Frange back accumuracy :	17 526 mm ±50μ
Vibration Resistance :	8G (10Hz - 150Hz) * IEC = International Electronic Technical
Shock Resistance :	80G (IEC 68) * IEC = International Electronic Technical Commission
Power Source :	+12V DC, 170mA
Ambient Operating Temperature :	14°F - 122°F (−10°C - +50°C)
Dimensions :	1-11/16" (W) × 1-1/8" (H) 2-13/16"(D) (44 (W) × 29 (H) × 72 (D) mm)
Weights :	0 37 lbs (170g) (Camera Head only)

Weight and dimensions indicated are approximate
Specifications are subject to change without notice

OPTIONAL ACCESSORY

Camera Cable GP-CA34

Panasonic®

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
CAUTION:
TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK) NO USER SERVICEABLE PARTS INSIDE
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL

This symbol warns the user that uninsulated voltage within the unit may have suificient magnitude to cause electric shock Therefore, it is dangerous to make any kind of contact with any inside part of this unit

This symbol alerts the user that important literature concerning the operation and maintenance of this unit has been included
Therefore, it should be read carefully in order to avoid any problems

IMPORTANT SAFETY NOTICE

There are special components used in this equipment which are important for safety These parts are indicated by the " ⚠ " mark on the schematic diagram and the replacement parts list It is essential that these critical parts should be repleced with manufacture's specified parts to prevent shock, fire, or other hazards
Do not modify the original design without permission of manufacture

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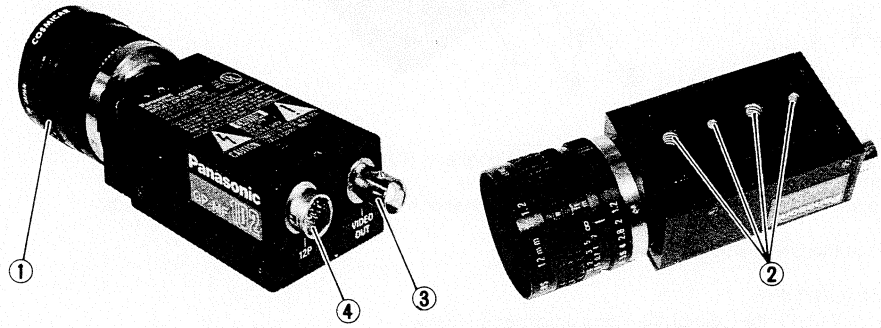
MAJOR OPERATING CONTROLS AND THEIR FUNCTIONS



1. 1/2" Manual Iris Lens (Sold Separately)

2. Mounting Holes
   There are two threaded holes (1/4") for mounting the camera onto the tripod and two more threaded holes (No 832 UNC) for mounting the camera onto mounting bracket

3. Video Output Connector (VIDEO)
   A 1 0Vp-p/75 ohm composite video signal is provided at this connector

4. Camera Cable Connector (12-pin)
   This connector is used to connect the optional Camera Cable GP-CA34

Pin No	Description
1	Ground
2	+12V IN*
3	Ground for Video Out
4	Video Out
5	Ground for EXT HD
6	EXT HD In
7	EXT VD In
8	Ground
9	Not Used
10	Ground
11	+12V IN
12	Ground for EXT VD

CAUTION :

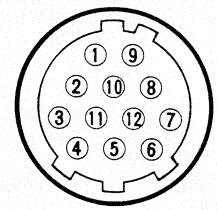
* CONNECT THIS TO A DC 12 V CLASS 2 POWER SUPPLY ONLY

EXT HD Input

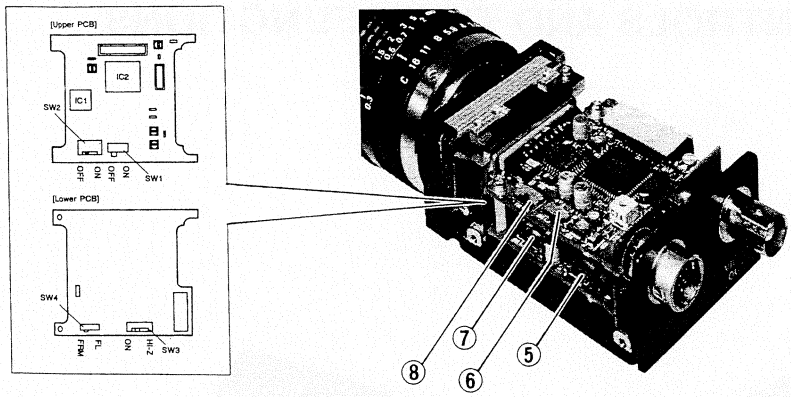
The 4Vp-p/75 ohm HD pulse should be supplied

EXT VD Input

The 4Vp-p/74 ohm VD pulse should be supplied



Front view



5. 75 ohms On/Hi-z Selection Switch (ON/HI-Z)
   By setting this switch to the ON position, the external input signal and HD/VD input signal are terminated with the 75 ohms impedance
   When bringing or looping through the external gen-lock input signal or HD/VD input signal, set this switch to the Hi-z position
   This switch is preset to the ON position at the factory

6. AGC On/Off Switch (ON/OFF)
   This switch is used to ON/OFF the gain of the video amplifier as follows
   ON :
   A clear picture is obtained at low light shooting by automatic increase of the gain up approx 12 dB
   OFF :
   A natural and low-noise picture is obtained at low light shooting This switch is preset to the OFF position at the factory

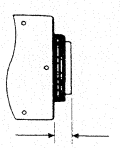
7 Field or Frame Readout Selection Switch (FL/FRM)
   This switch is used to select the readout period of each pixels as follows
   FL (Field) :
   The signals of each pixels are read out in every 1/60 seconds
   FRM (Frame) :
   The signals of each pixels are read out in every 1/30 seconds
   Note :
   The dynamic range in the Frame mode becomes approx 1/2 as compared with that in the Field mode, i e , a smear might be more noticeable in the Frame mode than that in the Field mode This switch is preset to the FRM position at the factory

8. Gamma Selection Switch (ON/OFF)
   This switch is used to select the gamma characteristic either 0 6 or 1 (linear) as shown in the figure
   ON :
   The gamma characteristic is 0 6
   OFF :
   The gamma characteristic is 1
   This switch is preset to the OFF position at the factory

PREPARATIONS

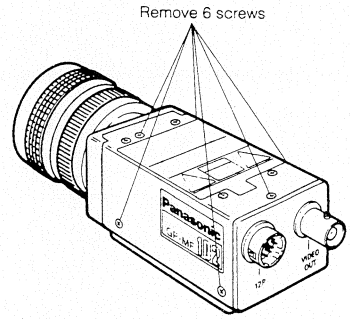
1. Power Supply for Camera
   Prepare a regulated DC power supply which can supply DC 12 V ± 10 % DC 170 mA or more current and rated CLASS 2

2. Lenses
   Be sure to use the optional manual iris lens having the following items
   Focus : Adjustable
   Lens Weight : Less than 300g (0 66 lbs)
   Note :
   If the lens weight exceed 300g (0 66 lbs), the camera and lens should be secured
   Mount : C-mount
   Caution :
   Lens mount should be as shown in the diagram, otherwise the lens will damage the camera



Less than 5/16"
(Less than 8 mm)

3. Top Cover Removal
   Caution :
   The following preparation should be made by qualified service personnel or system installers
   For selecting the 75 ohms On/Hi-z Selection Switch , Field or Frame Readout Selection Switch or AGC ON/OFF Switch and Gamma Selection Switch, the top cover of this camera should be removed
   Remove the six fixing screws as shown below



ADJUSTMENT PROCEDURE

1. Test Equipment Required

The following equipments are rquired for adjustment of the Industrial Camera GP-MF102.

- Oscilloscope
- Digital Voltmeter
- Underscanned Video Monitor
- DC Power Supply Unit
- HD/VD Signal Generator or Special Effects Generator
- Camera Cable GP-CA34
- Manual Iris Lens
- Lighting (2,750 ± 150 lux (1,050 ± 50 nt))
- Lightmeter
- 40-watt Lamp
- Logaritmic Gray Scale Chart (Part No. : YWV2310RB99) as shown in the Fig. 1-1.

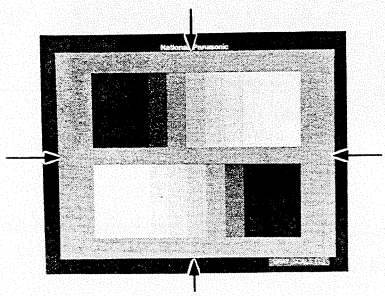


Fig. 1-1

2. Disassembling Procedure for Adjustment

- Referring to the Fig 2-1, remove six screws fixing the Upper Cover and remove Upper Cover.

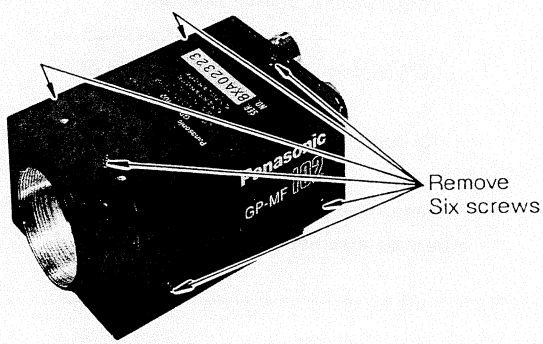


Fig. 2-1

- Referring to the Fig. 2-2, remove two screws fixing the Process Board

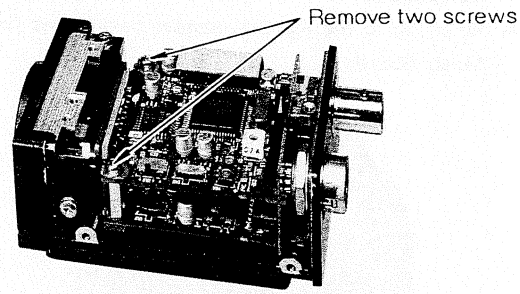


Fig. 2-2

- Referring to the Fig 2-3, remove two hex studs fixing the Power Board

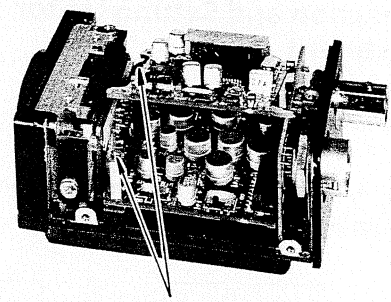


Fig. 2-3

- Referring to the Fig 2-4, remove two screws fixing the Rear Panel.

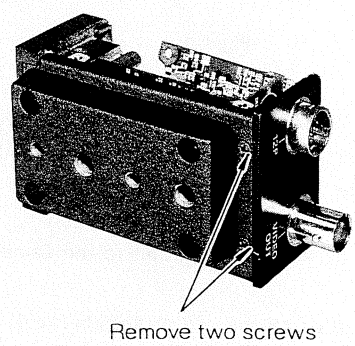


Fig. 2-4

3. Replacement Procedure of the CCD Image Sensor

- Disassemble the camer as previously described in the item 2 on page 3.
- Referring to the Fig 3-1, remove two screws fixing the Sensor Board

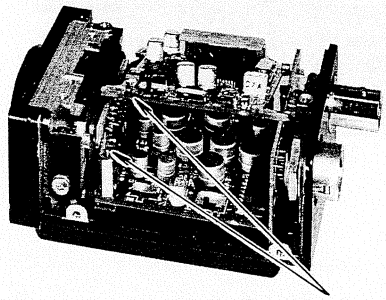


Fig. 3-1

4. Connection and Setting Up for Adjustment

4-1. Connection

- The Fig 4-1 shows the connection diagram for the adjustment procedure.

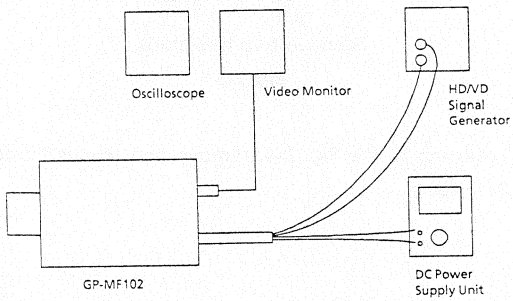


Fig. 4-1

- Connect the Underscanned Video Monitor to the Video Output Connector on the Rear Panel of the camera.
- Terminate the input terminal of the Underscanned Video Monitor with 75 ohms
- Connect DC Power Supply Unit to the Camera Cabel GP-CA34.

  Note: Refer to the pin arrangement of the Camera Cable described in the Camera Cable Connector (12-pin) on page 1.
- Connect the Camera Cble to the Camera Cable Connector on the Rear Panel of the camera
- Connect the HD/VD Signal Generator to the HD and VD Connectors of the Camera Cable
- Connect the prove either the Digital Voltmeter or Oscilloscope at desired test point in each adjustment step

4-2. Setting Up for the Standard Picture

- Set the Logarithmic Gray Scale Chart.
- Incident light intensity of 2,750 ± 150 lux (1,050 ± 50 nt) on the Logarithmic Gray Scale Chart.
- Mount the Manual Iris Lens on the camera.
- Aim the camera at the Logarithmic Gray Scale Chart
- Set the camera so that the gray scale chart becomes full picture on the Underscanned Video Monitor.
- Connect the Oscilloscope to TP1 (CCD OUT) on the Process Board.
- Tur the lens focus to obtain correct focal point.
- Turn the lens iris so that the peak level of the gray scale from the Blanking level becomes 200 ± 10 mV as shown in the Fig 4-2

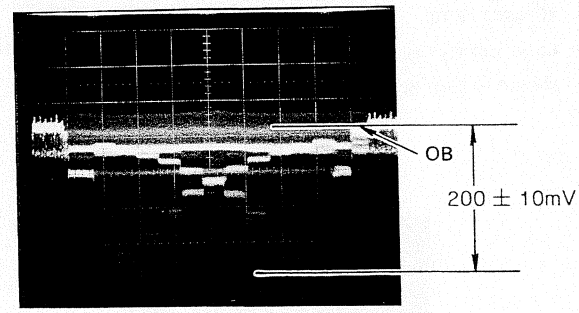


Fig. 4-2

- The adjustments should be done with this standard picture, unless otherwise specified

4-3. Initial Position of the Controls and Switches for Adjustment

- Set the switches on the Process and Power boards of the camera as follows :

  SW1 (AGC On/Off) : OFF position
  SW2 (Gamma Selection) : OFF position
  SW3 (75 ohms On/Hi-Z Selection) : ON position
  SW4 (Field or Frame Readout Selection) : Field position
  All Volume Controls : Mechanical Center Position

- The adjustments should be done with this setting unless otherwise specified.

5. Adjustment Procedure

- Refer to the Location of the test Points and Adjusting Controls on page 8.

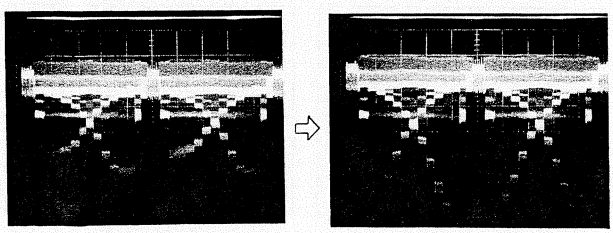
(1) Confirm the DC power sources

- Connect the DC Power Supply Unit to the camera.
- Adjust the output control of the DC Power Supply Unit to obtain 12V DC at Pin 3 of IC1 on the Rear board.
- Confirm 9V DC power source at Pin 1 of IC1 on the Rear board, this voltage should be 9 ± 0.35V DC.
- Confirm 5V DC power source at TP6 on the Process board. This voltage should be 5 ± 0.25V DC.
- Confirm 15.7V DC power source at TP5 on the Process board, this voltage should be 15.7 ± 0.5V DC.
- Confirm -8V DC power source at TP6 on the Power board, this voltage should be -8 ± 0.5V DC.

(2) Substaitum Voltage (Vsub (DDC Bias)) Coarse Adjustment

Test Point :	**TP1 (CCD OUT)**	**Process board**
Adjust :	**BR1 (Vsub)**	**Process board**

- Connect the Video Monitor to the Video Output Connector.
- Terminate the input terminal of the Video Monitor with 75 ohms.
- Connect the Osiclloscope to TP1 (CCD OUT)
- Aim the camera at the Logarithmic Gray Scale Chart
- Referring to the Fig 5-1, turn the lens iris so that the CCD Output level becomes 600 mVp-p.
- Adjust VR1 (Vsub) so that the signal does not clipping
- The CCD Output signal should not be clippied within the level of 600 mVp-p.



No Good Good

Fig. 5-1

(3) Pedestal Adjustment

Test point :	**VIDEO OUTPUT CONNECTOR**	
		Rear panel
Adjust :	**VR3 (PEDESTAL)**	**Precess board**

- Cap on the lens.
- Connect the Video Monitor to the Video Output Connector.
- Terminate the input terminal of the Video Monitor with 75 ohms.
- Connect the Oscilloscope to the Video Output Connector.
- Trigger the Oscilloscope at TP3 (HD).
- Referring to the Fig 5-2, adjust VR3 (PEDESTAL) so that the Pedestal Level becomes 50 ± 10 mVp-p.

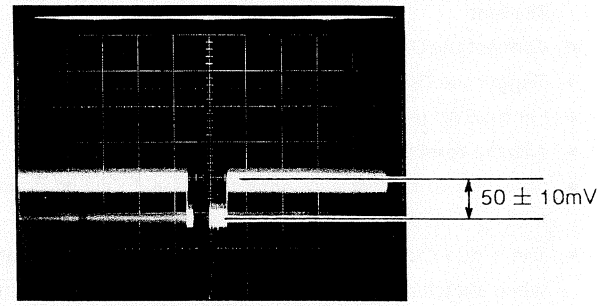


Fig. 5-2

(4) Video Output Level Adjustment at AGC Off

Test point :	**VIDEO OUTPUT CONNECTOR**	
		Rear panel
Adjust :	**VR4 (AGC OFF)**	**Process board**

- Connect the Video Monitor to the Video Output Connector.
- Terminate the input terminal of the Video Monitor with 75 ohms
- Connect the Oscilloscope to the Video Output Connector.
- Trigger the Oscilloscope at TP3 (HD)
- Set both SW1 (AGC ON/OFF) and SW2 (GAMMA ON/OFF) to Off positions
- Aim the camera at the Logarithmic Gray Scale Chart
- Referring to the Fig 5-3, adjust VR4 (AGC OFF) to obtain 0.714 ± 0.03V p-p
- The Video Output Level should be in the specifications when switching the SW2 (GAMMA ON/OFF) to On and Off positions
  If not, re-adjust VR4 (AGC OFF)
- Note : All switches must be re-set to an initial position after completed this adjustment

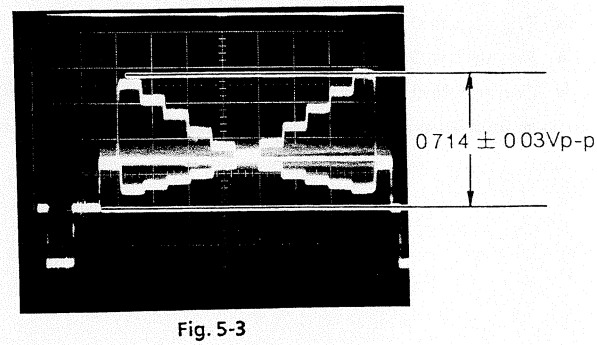


Fig. 5-3

(5) Video Output Level Adjustment at AGC On

Test point : VIDEO OUTPUT CONNECTOR Rear panel
Adjust : VR2 (AGC ON) Process board

- Connect the Video Monitor to the Video Output Connector
- Terminate the input terminal of the Video Monitor with 75 ohms
- Connect the Oscilloscope to the Video Output Connector.
- Trigger the Oscilloscope at the TP3 (HD).
- Set the SW1 (AGC ON/OFF) to On position.
- Aim the camera at the Logarithmic Gray Scale Chart.
- Referring to the Fig. 5-4, adjust VR2 (AGC ON) to obtain 0 714 ± 0.03V p-p.
- The Video Output Level should be in the specifications when switching the SW2 (GAMMA ON/OFF) to On and Off position.
  If not, re-adjust VR4 (AGC OFF).
- Note : All switches must be re-set to an initial position after complieted this adjustment.

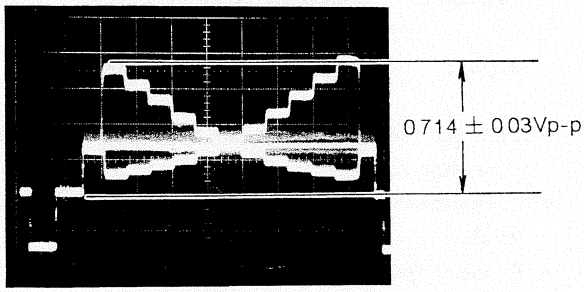


Fig. 5-4

(6) Confirmation of the Sync Signal Level

Test point : VIDEO OUTPUT CONNECTOR Rear panel
Adjust : None

- Connect the Video Monitor to the Video Output Connector.
- Terminate the input terminal of the Video Monitor with 75 ohms
- Connect the Oscilloscope to the Video Output Connector.
- Trigger the Oscilloscope at the TP3 (HD) for the HD.
- Trigger the Oscilloscope at the TP2 (VD) for the VD.
- Confirm that the Sync signal level shold be within 0 286 ± 0 03 Vp-p

(7) Substaitum Voltage (Vsub (CCD Bias)) Adjustment

Adjust : VR1 (Vsub) Process board
Observe : UNDERSCANNED VIDEO MONITOR

- Connect the Video Monitor to the Video Output Connector
- Terminate the input terminal of the Video Monitor with 75 ohms
- Referring to the Fig. 5-5, aim the camera at 40-watt lamp placed in the dark background

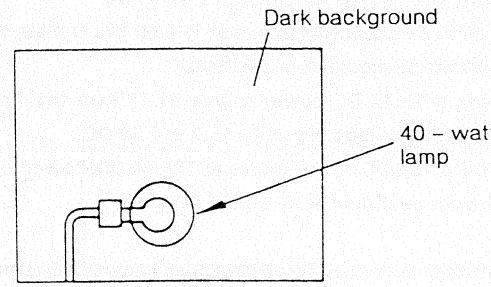


Fig. 5-5

- Turn the lens iris fully open.
- Referring to the Fig 5-6, while observing the picture on the Video Monitor, adjust VR1 (Vsub) so that the blooming and noise on the monitor screen become minimized.
  Notes : VR1 should be adjusted when the blooming becomes just eliminated
  Do not adjust VR1 more than that point
  Check to insure that the clipping level of the CCD Output is more than 600 mVp-p after completing of the Substaitum Voltage Adjustment.

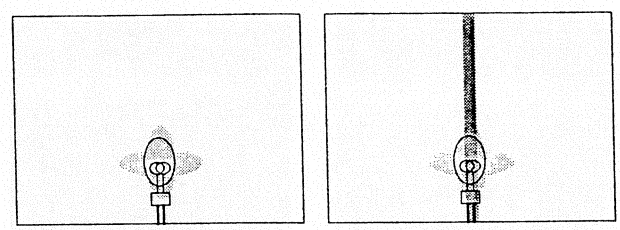


Fig. 5-6

(8) PLL FCO Adjustment

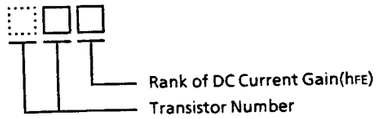
Test point : TP4 (PLL VCO) Process board
djust : L5 (VCO) Process board

- Supply the HD/VD signals to the camera through the camera cable.
- Connect the Digital Voltmeter to TP4 (PLL VCO).
- Adjust the L5 (VCO) to obtain 2.5 ± 0.1V DC.

CHIP COMPONENTS

1. Chip Transistor

The transistor number is indicated on the top surface of the chip transistor using two alphabet letters or one numerical and two alphabet letters.



Transistor Number

(Chip Transistor)

Letter	Transistor No.	Letter	Transistor No.
A	2SB709	X	2SD602A
B	2SB709A	Y	2SD601
C	2SB710	Z	2SD601A
D	2SB710A	1A	2SB799
E	2SA1022	1B	2SB814
F	2SA1034	1C	2SB902
H	2SA1035	1F	2SK321
I	2SB792	1K	2SK316
K	2SC2778	1L	2SK247
P	2SD814	1M	2SJ84
Q	2SD813	1N	2SK199
R	2SC2480	1O	2SK198
S	2SC2405	1T	2SC3077
T	2SC2406	1X	2SC2845
U	2SC2404	1Z	2SD1030
V	2SC2295	2B	2SK374
W	2SD602	2C	2SK116

(Small Chip Transistor)

Letter	Transistor No.
A	2SB1218
U	2SC3931
W	2SD1820
Y	2SD1819
E3	2SA1226
OS	2SB1219
UC	2SA1532
YU	2SC3938

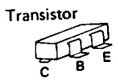
(Pair Transistor)

Letter	Transistor No.
5C	XN4601
5N	XN6501
5O	XN6401

Example : WQ ⟶ 2SD602 - Q
YQ ⟶ 2SD601 - Q
1BS ⟶ 2SB814 - S

Appearance and Symbols

Transistor



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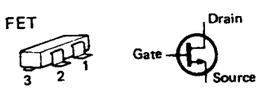
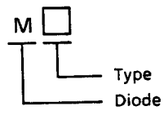


	1	2	3
Except 2SK199	Drain	Source	Gate
2SK199	Gate	Drain	Source

2. Chip Diode

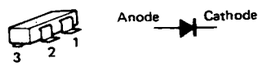
The diode number is indicated on the top surface of the chip diode using Two alphabet letters.



Diode Number

Letter	Diode No.	Letter	Diode No.
MA	MA151A	MI	MA152K
MB	MA152A	MK	MA28W-B
MC	MA153	ML	MA28T-A
MD	MA28-A	MN	MA151WA
ME	MA28-B	MO	MA152WA
MF	MA28W-A	MT	MA151WK
MH	MA151K	MU	MA152WK

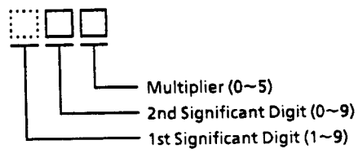
Appearance and Symbols



	1	2	3
MA28/MA28W/MA28T	-	Anode	Cathode
MA151K/MA152K	-	Anode	Cathode
MA151A/MA152A	-	Cathode	Anode
MA151WK/MA152WK	Anode	Anode	Cathode
MA151WA/MA152WA	Cathode	Cathode	Anode
MA153	Cathode	Anode	Common

3. Chip Resistor

The resistor value is indicated on the bottom surface of the chip resistor using three digit numbers.



Example : 330 ⟶ $33 \times 10^0 = 33$ ohms
561 ⟶ $56 \times 10^1 = 560$ ohms
123 ⟶ $12 \times 10^3 = 12$ ohms

Note : Zero ohm resistor (jumper chip) is colored red or green.

4. Chip Capacitor

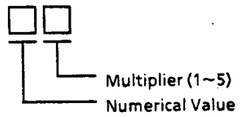
The capacitive value of replacement chip capacitors is indicated on the bottom surface. Original parts do not have value indication.

If the capacitive value is less than 100 pF, the value will be indicated by one or two digit number expressing the capacity directly in pF.

Example :

0.5 ⟶	0.5 pF	2.5 ⟶	2.5 pF
75 ⟶	0.75 pF	33 ⟶	33 pF
1 ⟶	1 pF	82 ⟶	82 pF

If the capacitive value is 100 pF or greater, the value will be indicated by an alpha-numeric code. The letter precedes the number and expresses a numerical value to be multiplied by the number which follows.



Numerical Value

Letter	Value	Letter	Value
A	10	N	33
B	11	P	36
C	12	O	39
D	13	R	43
E	15	S	47
F	16	T	51
G	18	U	56
H	20	V	62
J	22	W	68
K	24	X	75
L	27	Y	82
M	30	Z	91

*Letters I and O are not used

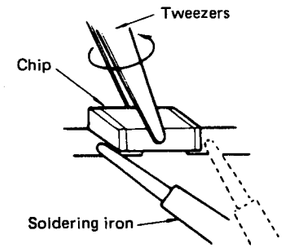
Example : A1 ⟶ $10 \times 10^1 = 100$ pF
N2 ⟶ $33 \times 10^2 = 3300$ pF
S3 ⟶ $47 \times 10^3 = 47000$ pF

5. Precautions in replacing the chip component

1. Make sure that the unit is turned OFF when replacing the chip.
2. Use tweezers to prevent any damage to the chip surface.
3. Do not re-use the chips after removal.
4. Do not rub the electrode of chips.
5. Do not subject the chips to excessive stress.
6. It is recommended that a pencil-type soldering iron to be used.
7. The solder whose diameter is less than 0.5 mm is recommended.
8. Do not heat the chip beyond 3 seconds.
9. Maintain temperature control under 260°C (500°F) when soldering.

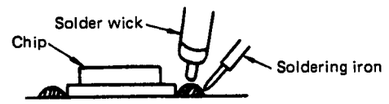
5-1 Removal (Transistor, Diode, Resistor and Capacitor)

1. Add the solder to both ends of the chip (three leads for chip transistor).
2. While attaching the soldering iron to both ends of the chip (three leads for chip transistor) as shown below, remove the chip by turning it with tweezers.
   Note : Be careful not to damage other chips.

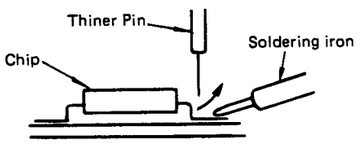


5-2 Removal (IC)

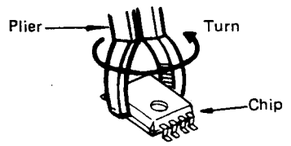
1. Add the solder wick and solder iron to each lead of the IC and remove solder.



2. Add the solder iron to each lead of the IC and left each lead of the IC using thiner pin.

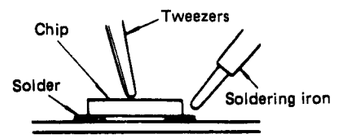


3. Remove IC turning it with plier.

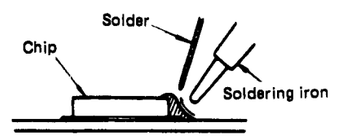


5-3 Mounting

1. Place the solder thinly on the chip mounting foil.
2. Solder the chip temporarily while holding the chip with the tweezers.



3. Solder both ends of chip (three leads for chip transistor).



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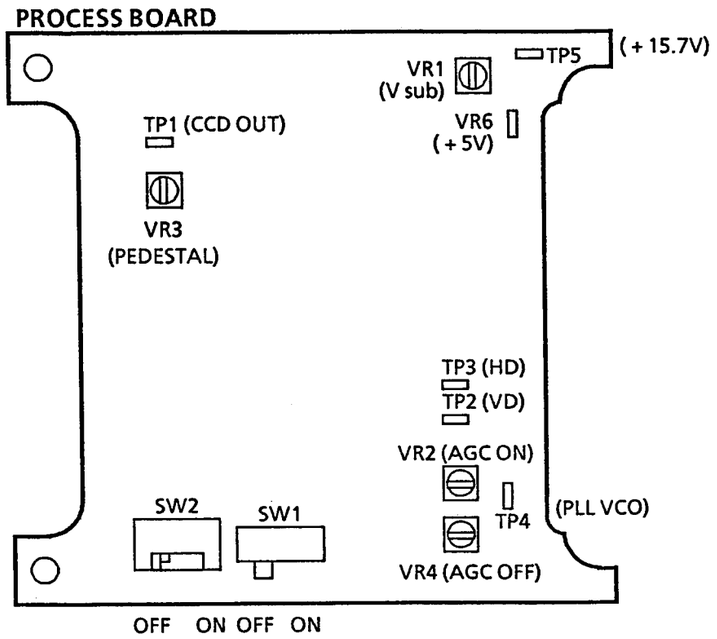
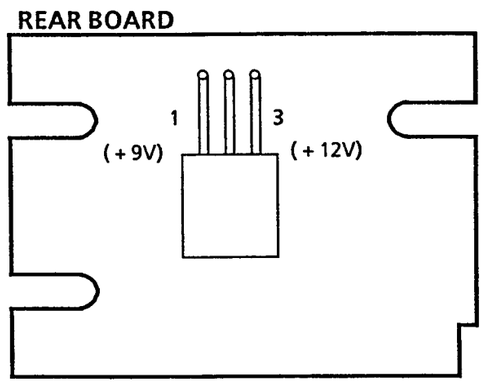
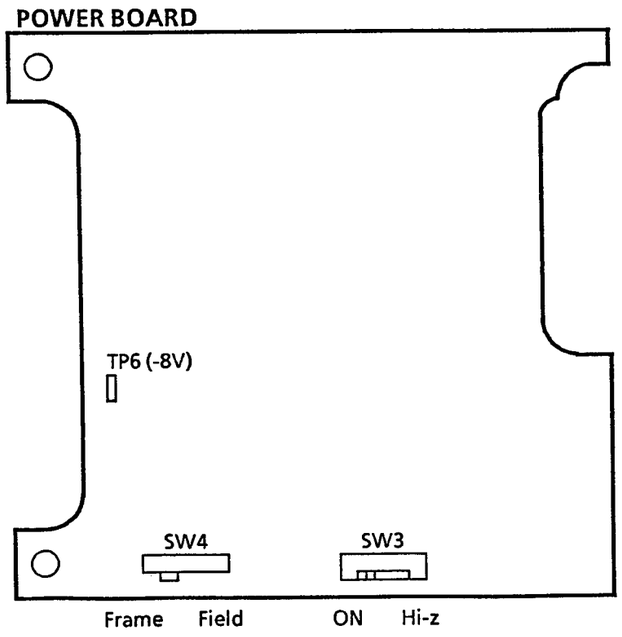
LOCATION OF TEST POINTS AND ADJUSTING CONTROLS

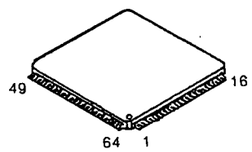






APPEARANCE OF IC, TRANSISTOR AND DIODE

MN5168



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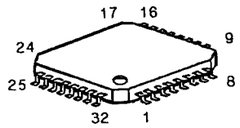
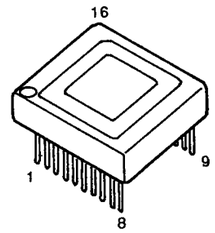
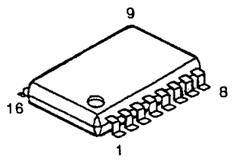


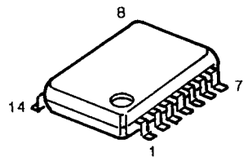
MN3716AN



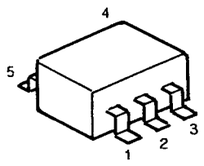
YWUPD16501GS



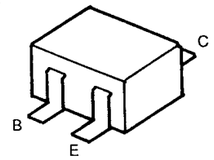
YWMC74HC242F



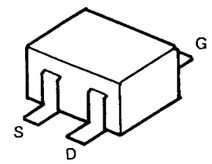
YWTC7S04FR
YWTC7S04F



2SA1462, 2SA1576
2SA1737, 2SB709-QRS
2SC3735, 2SC4081-QRS
2SD601-QRS



2SK662-QRS



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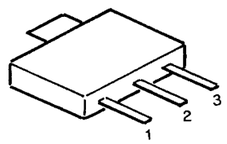
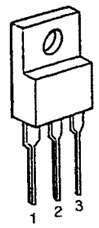
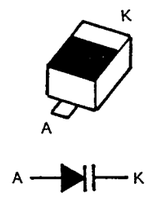


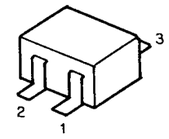
NJM7809A

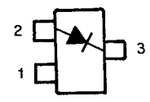


MA372

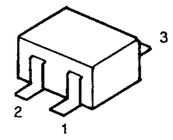


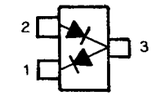
YWRB421D
MA141K
MA151K





MA143
MA153





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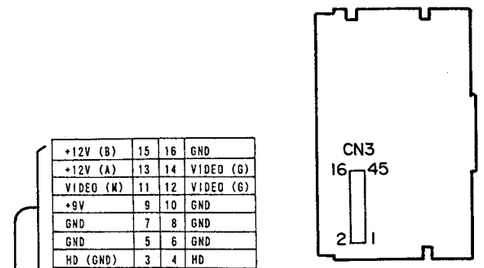
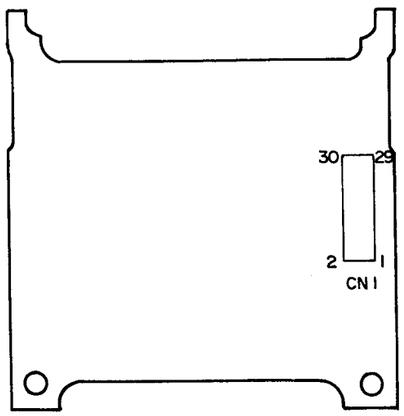
WIRING DIAGRAM

REAR BOARD



+12V (B)	15	16	GND
+12V (A)	13	14	VIDEO (G)
VIDEO (W)	11	12	VIDEO (G)
+9V	9	10	GND
GND	7	8	GND
GND	5	6	GND
HD (GND)	3	4	HD
VD (GND)	1	2	VD

+12V (B)	15	16	GND
+12V (A)	13	14	VIDEO (G)
VIDEO (W)	11	12	VIDEO (G)
+9V	9	10	GND
GND	7	8	GND
GND	5	6	GND
HD (GND)	3	4	HD
VD (GND)	1	2	VD

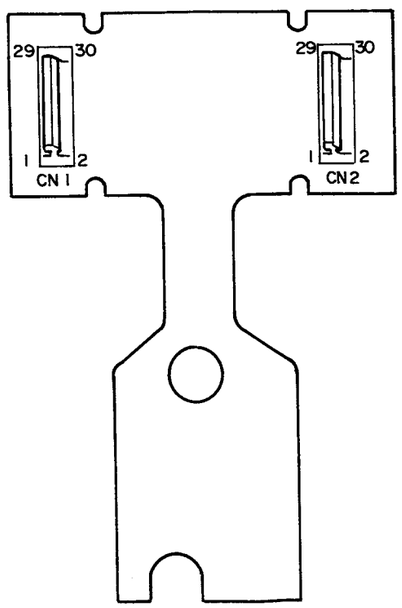


PROCESS BOARD

CCDOUT	2	1	GND (S)
GND (S)	4	3	GND (S)
OXSUB	6	5	OR
GND (D)	8	7	+15V
GND (D)	10	9	GND (D)
GND (D)	12	11	GND (D)
OH1	14	13	OH2
VIDEO (W)	16	15	OV4
GND (A)	18	17	OV3
+9V	20	19	OV2
IFFSW	22	21	OV1
+5V (D)	24	23	GND (S)
OCH2	26	25	+5V (A)
OWHD	28	27	OCH1
IHD	30	29	IVD

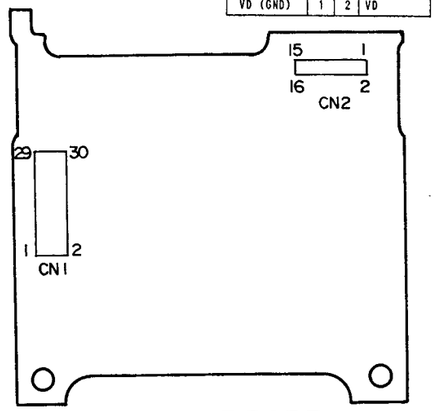
CCDOUT	2	1	GND (S)
GND (S)	4	3	GND (S)
OXSUB	6	5	OR
GND (D)	8	7	+15V
GND (D)	10	9	GND (D)
GND (D)	12	11	GND (D)
OH1	14	13	OH2
VIDEO (W)	16	15	OV4
GND (A)	18	17	OV3
+9V	20	19	OV2
IFFSW	22	21	OV1
+5V (D)	24	23	GND (S)
OCH2	26	25	+5V (A)
OWHD	28	27	OCH1
IHD	30	29	IVD

SENSOR BOARD



OXH2	2	1	+8V
OHX1	4	3	-8V
OXV3	6	5	GND
OXV4	8	7	GND (S)
OXV2	10	9	GND (S)
OXV1	12	11	+15V
IH1	14	13	IH2
VIDEO (W)	16	15	IV4
GND (A)	18	17	IV3
+9V	20	19	IV2
FFSW	22	21	IV1
+5V (D)	24	23	GND (D)
ICH3	26	25	+5V (A)
IWHD	28	27	ICH1
OHD	30	29	OVD

OXH2	2	1	+8V
OHX1	4	3	-8V
OXV3	6	5	GND
OXV4	8	7	GND (S)
OXV2	10	9	GND (S)
OXV1	12	11	+15V
IH1	14	13	IH2
VIDEO (W)	16	15	IV4
GND (A)	18	17	IV3
+9V	20	19	IV2
FFSW	22	21	IV1
+5V (D)	24	23	GND (D)
ICH3	26	25	+5V (A)
IWHD	28	27	ICH1
OHD	30	29	OVD

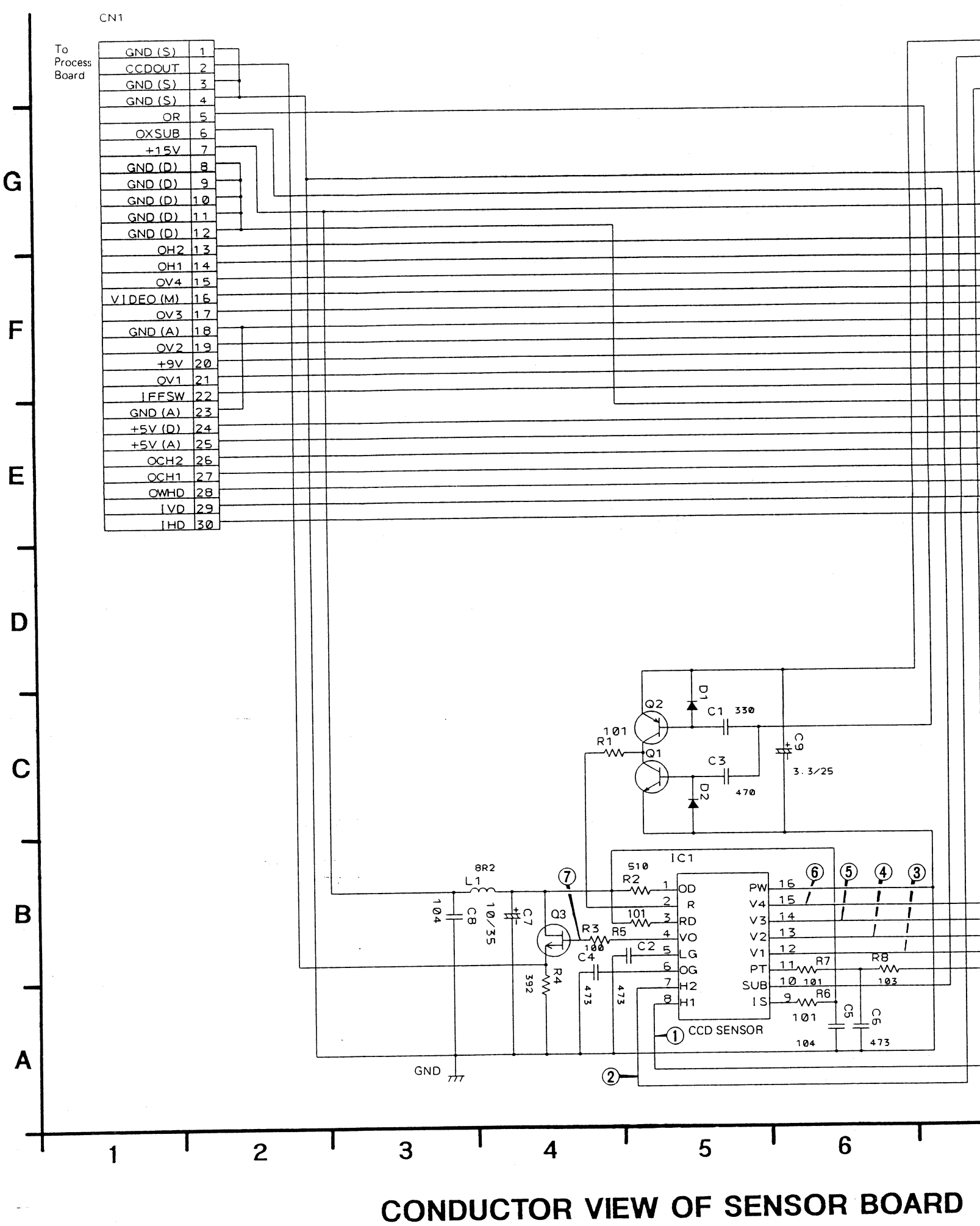


POWER BOARD

SCHEMATIC DIAGRAM OF SENSOR BOARD

Sensor Board

IC1	B5	Q1	C5
		Q2	C5
		Q3	B4



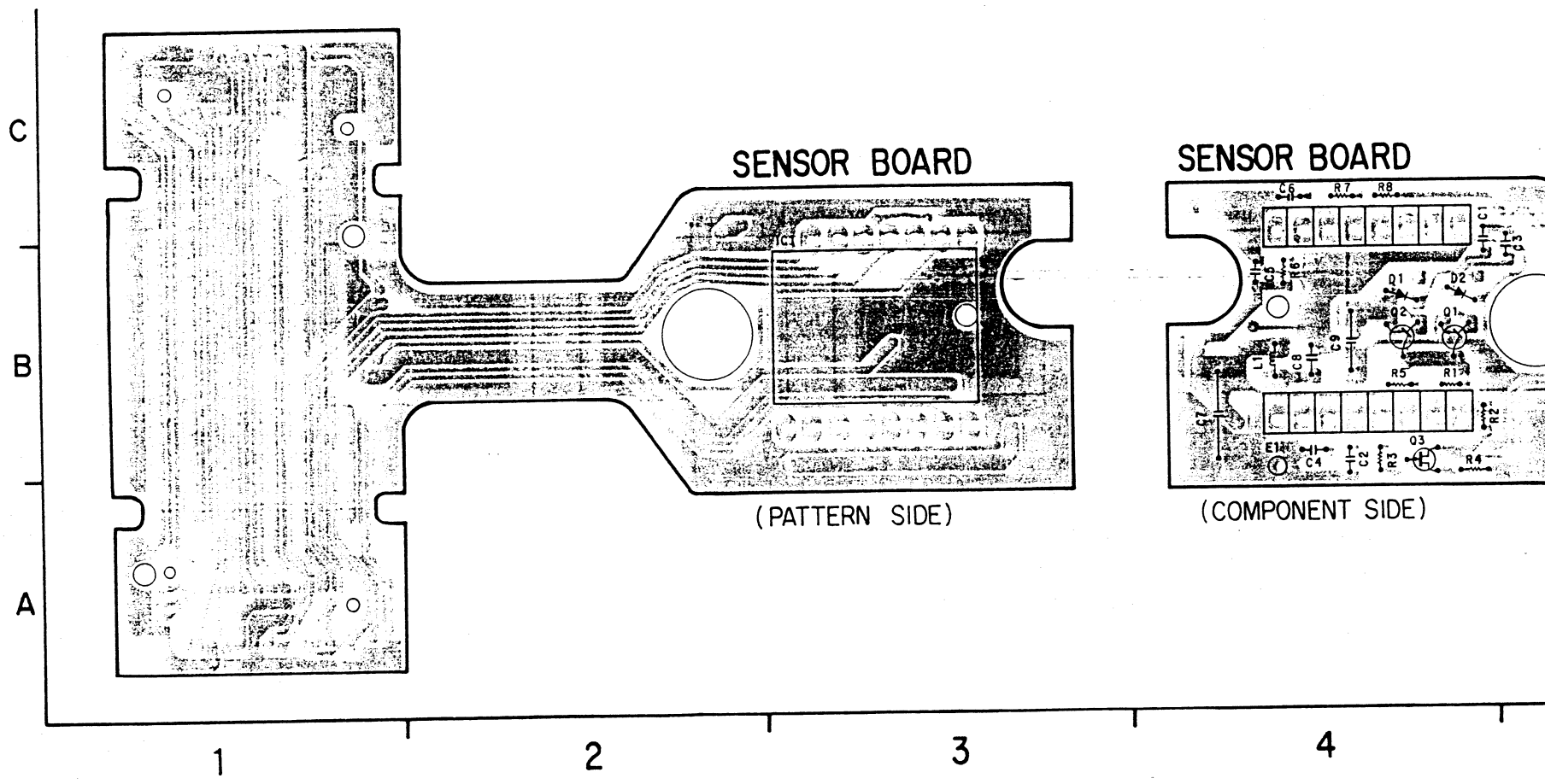
CONDUCTOR VIEW OF SENSOR BOARD

Component Side

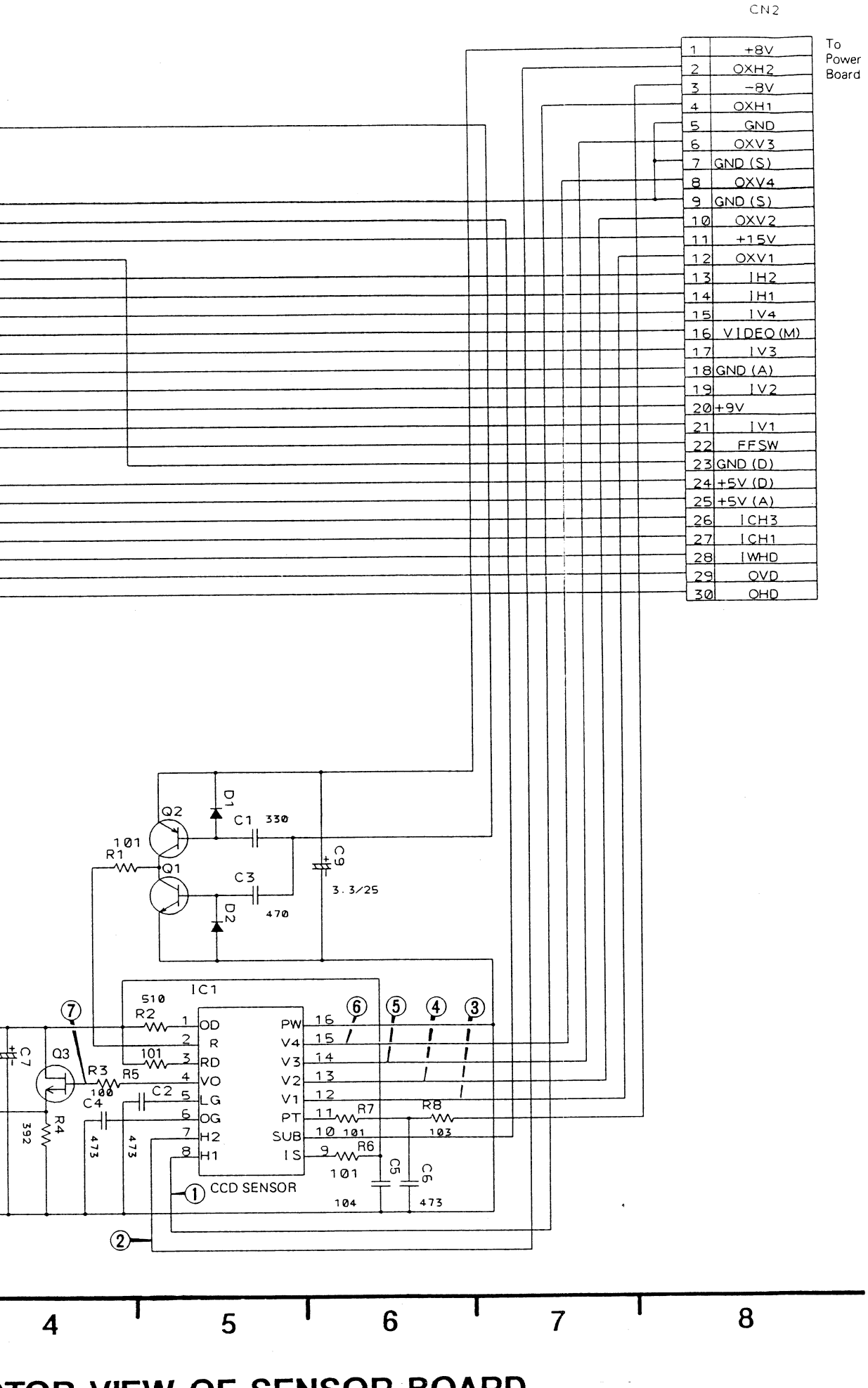
Q1	B4
Q2	B4
Q3	B4

Pattern Side

IC1	B3



C DIAGRAM OF SENSOR BOARD

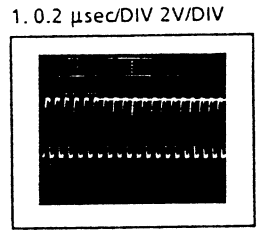


Sensor Board

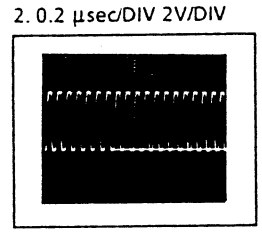
Pin	IC1
1	15.6
2	11.2
3	15.7
4	11.2
5	3.3
6	1.8
7	2.8
8	3.2
9	15.7
10	7.0
11	-8.2
12	-6.7
13	0.8
14	-6.9
15	0.7
16	0.0

	B	C	E
Q1	0.4	1.1	0.0
Q2	8.2	1.1	8.2
Q3	(G)11.1	(D)15.7	(S)11.1

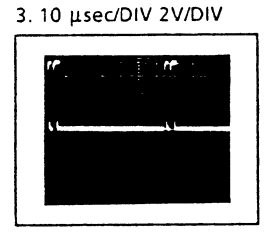
1. 0.2 µsec/DIV 2V/DIV



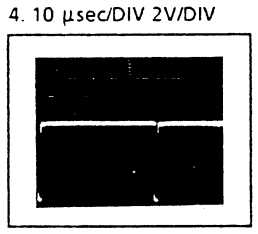
2. 0.2 µsec/DIV 2V/DIV



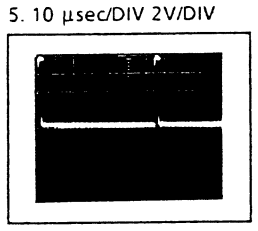
3. 10 µsec/DIV 2V/DIV



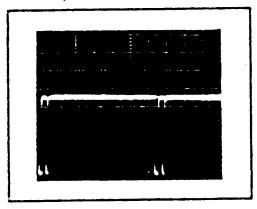
4. 10 µsec/DIV 2V/DIV



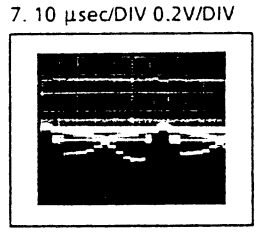
5. 10 µsec/DIV 2V/DIV



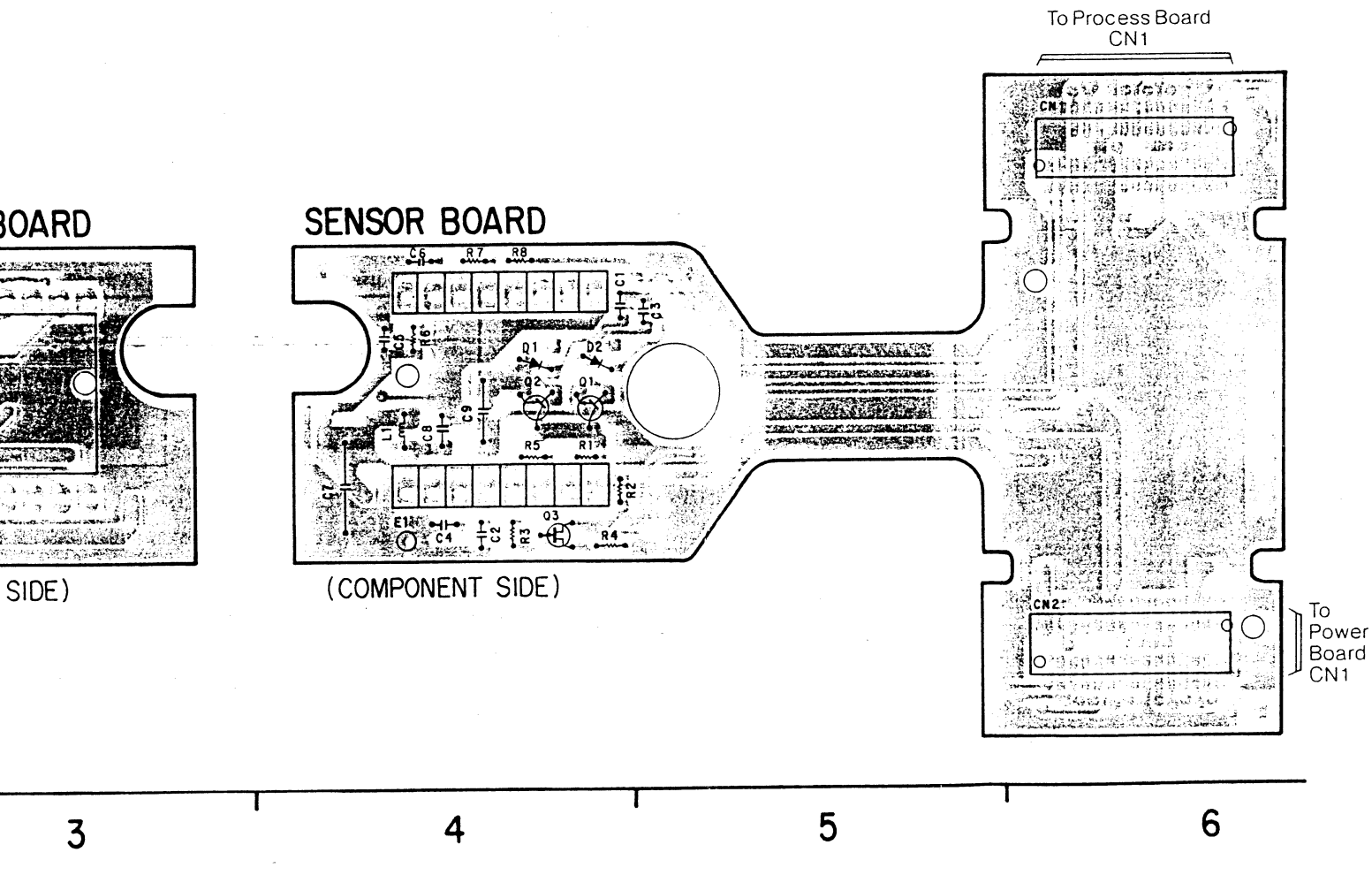
6. 10 µsec/DIV 2V/DIV



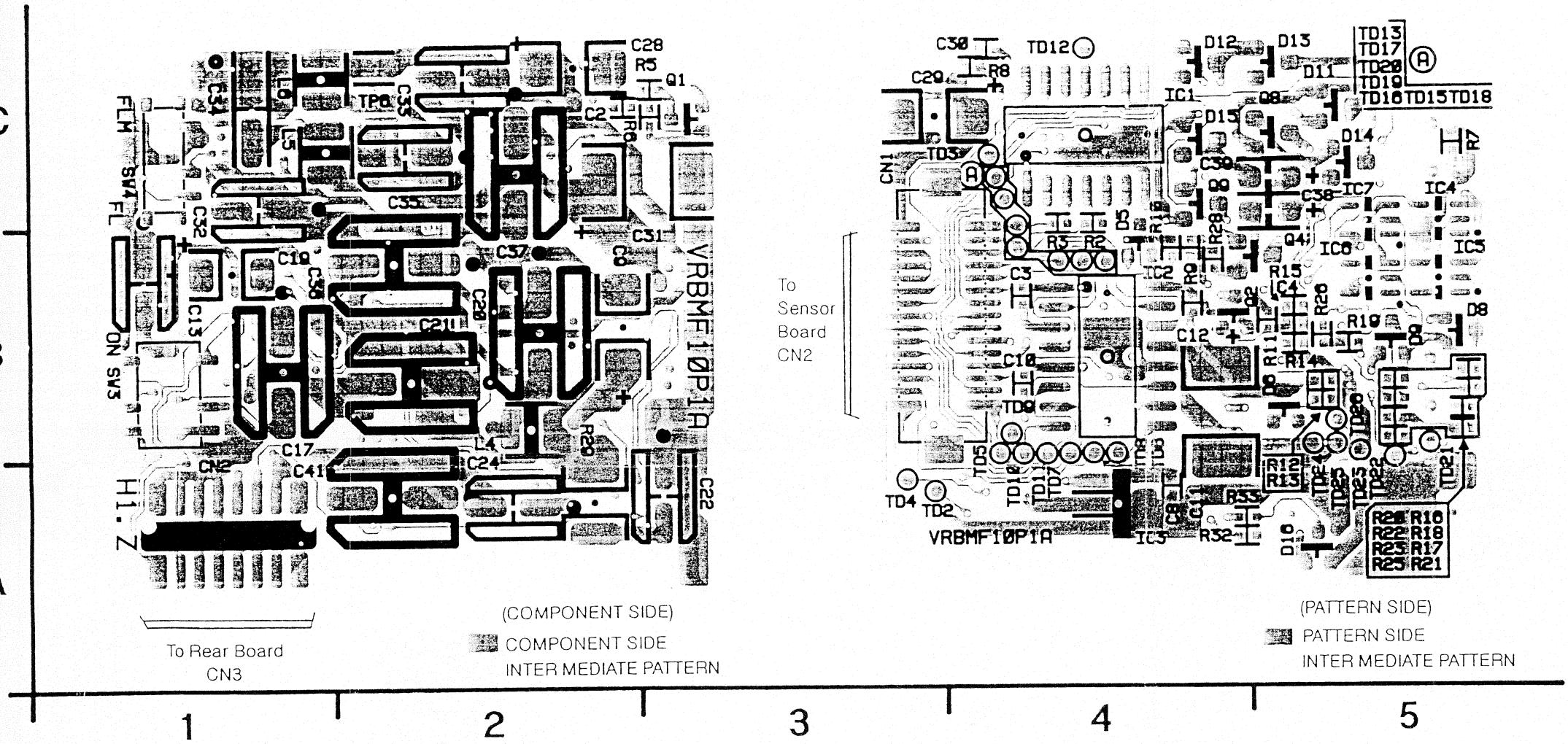
7. 10 µsec/DIV 0.2V/DIV



CTOR VIEW OF SENSOR BOARD



CONDUCTOR VIEW OF POWER BOARD



Component Board

Q1	C3

Pattern Side

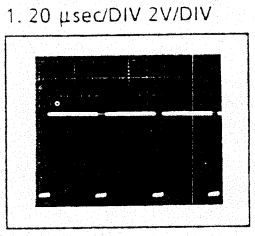
IC1	C4
IC2	B4
IC3	A4
IC4	C5
IC5	B5
IC6	B5
IC7	C5
Q2	B4
Q4	B5
Q8	C5
Q9	C4
D5	B4
D6	B5
D8	B5
D9	B5
D11	C5
D12	C4
D13	C5
D14	C5
D15	C4
D16	A5

Power Board

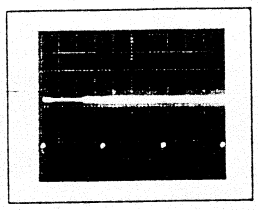
Pin	IC1	IC2	IC3	IC4	IC5	IC6	IC7
1	6.0	-7.2	5.1	1.6	1.4	1.8	1.4
2	1.8	0.8	0.0	0.0	3.8	3.6	0.1
3	2.7	0.0	7.6	0.0	0.0	0.0	0.0
4	3.2	-6.6		5.1	0.0	0.1	5.1
5	6.0	5.1		5.1	5.1	5.1	5.1
6	6.0	4.6					
7	0.0	5.1					
8	0.0	0.2					
9	0.0	0.2					
10	2.2	5.0					
11	2.7	4.8					
12	1.8	0.0					
13	6.0	15.1					
14	6.0	-6.8					
15		0.8					
16		1.0					

	B	C	E
Q1	6.7	8.0	6.0
Q2	1.6	5.1	1.0
Q4	0.8	8.9	3.0
Q8	8.4	7.4	8.9
Q9	-0.4	7.4	0.0

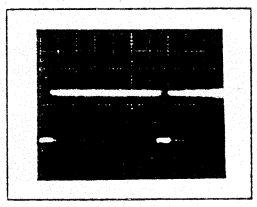
1. 20 µsec/DIV 2V/DIV



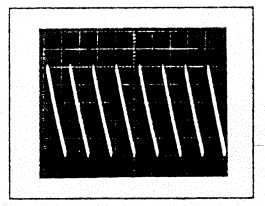
2. 5 msec/DIV 2V/DIV



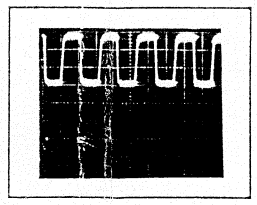
3. 10 µsec/DIV 2V/DIV



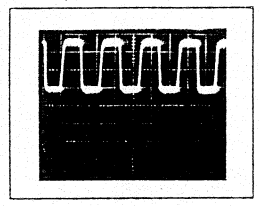
4. 50 µsec/DIV 0.1V/DIV



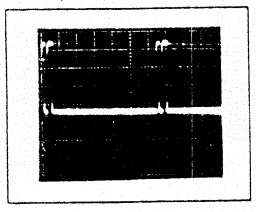
5. 50 nsec/DIV 2V/DIV



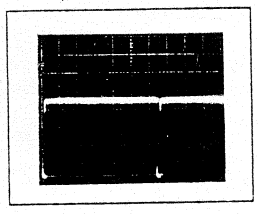
6. 50 nsec/DIV 2V/DIV



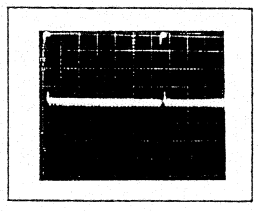
7. 10 µsec/DIV 2V/DIV



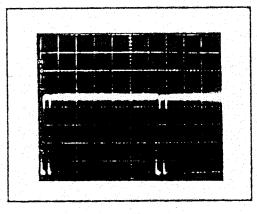
8. 10 µsec/DIV 2V/DIV



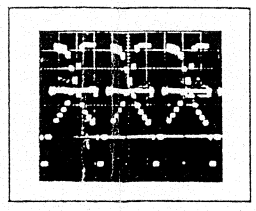
9. 10 µsec/DIV 2V/DIV



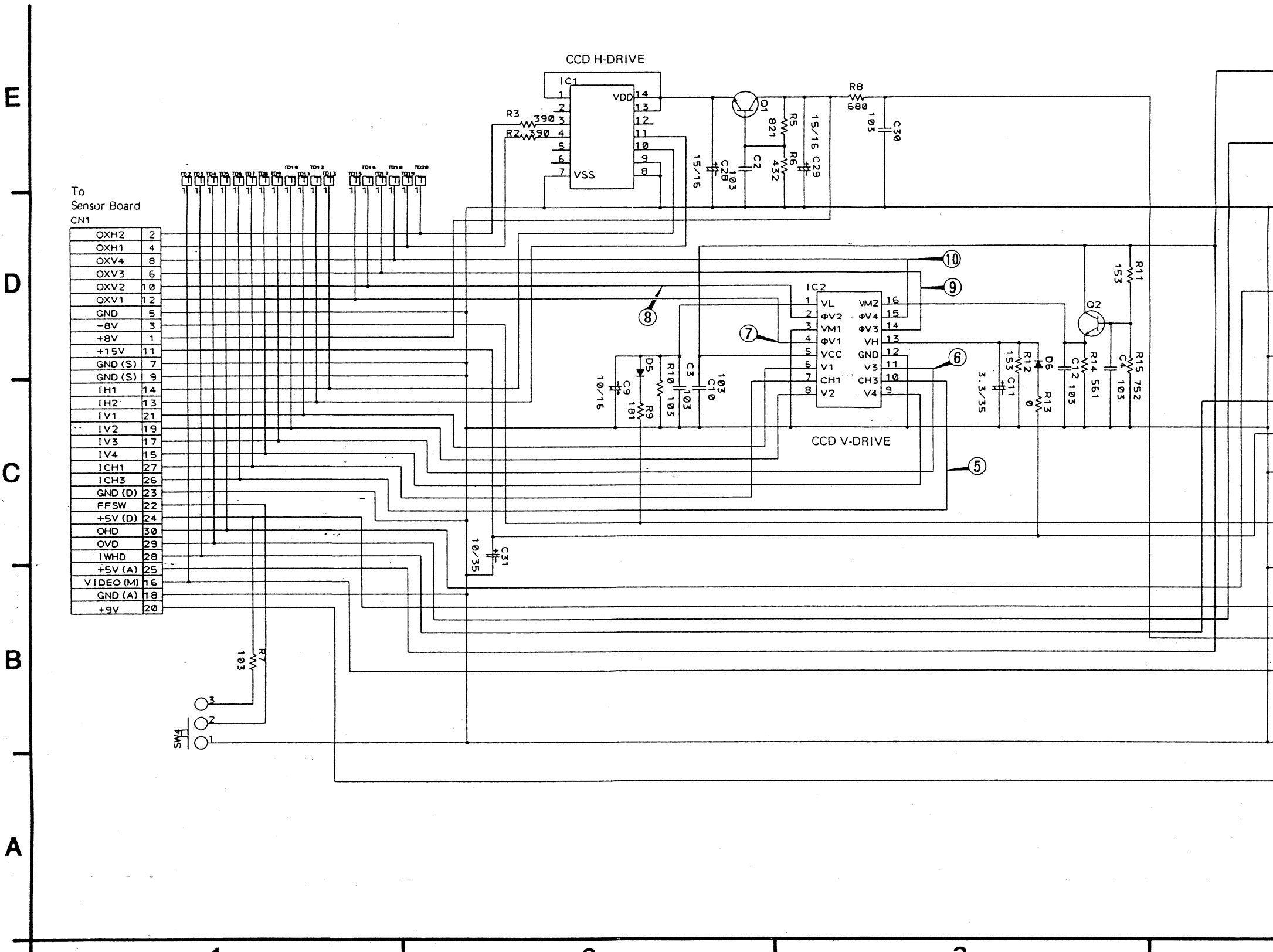
10. 10 µsec/DIV 2V/DIV



11. 20 µsec/DIV 0.2V/DIV



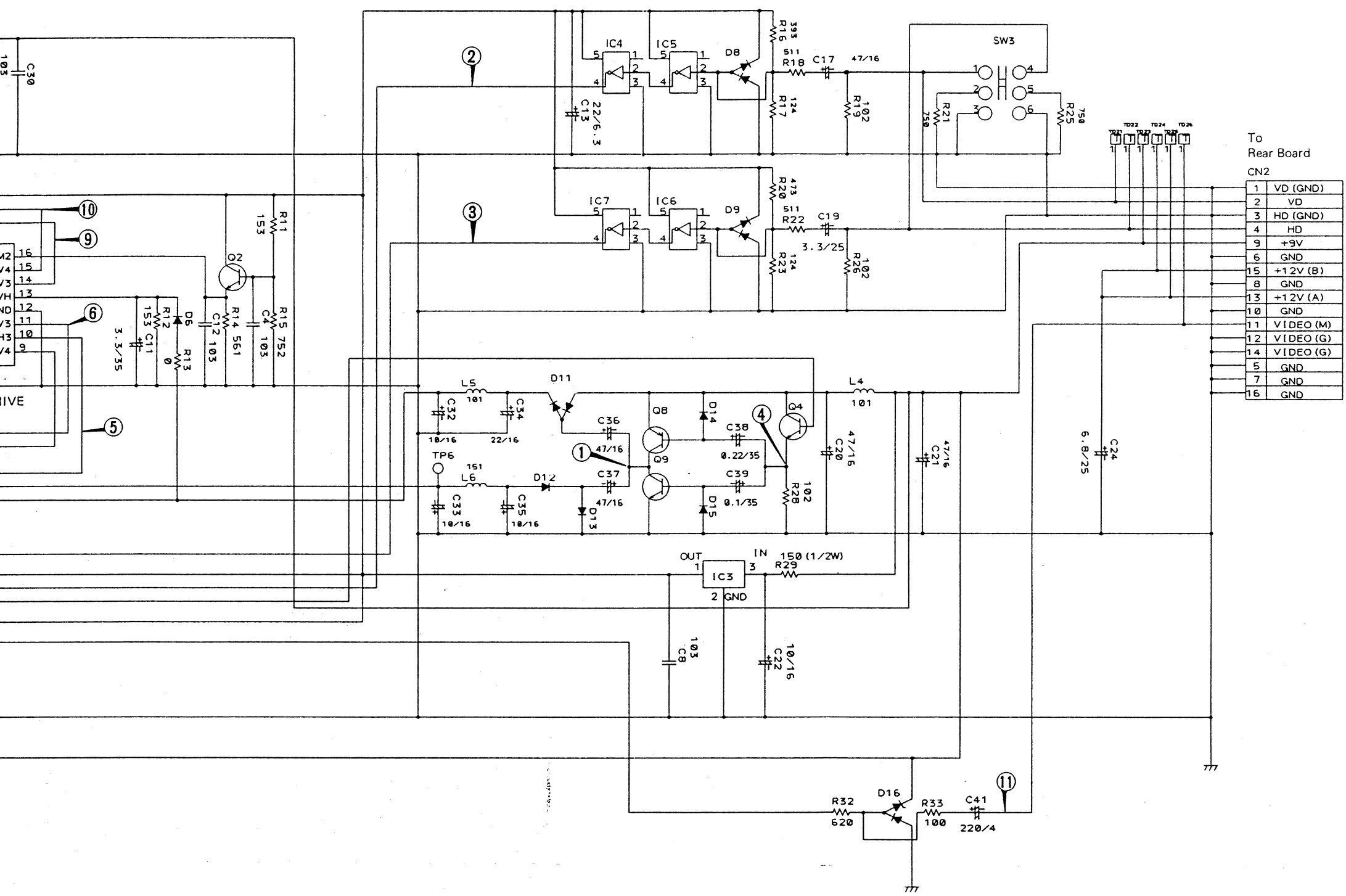
SCHEMATIC DIAGRAM OF POWER



Power Board

IC1	E2	Q1	E2	D5	C2
IC2	D3	Q2	D3	D6	C3
IC3	B5	Q4	C5	D8	E5
IC4	E4	Q8	C4	D9	D5
IC5	E5	Q9	C4	D11	C4
IC6	D4			D12	C4
IC7	D5			D13	C4
				D14	C5
				D15	C5
				D16	A5

EMATIC DIAGRAM OF POWER BOARD



3 4 5 6

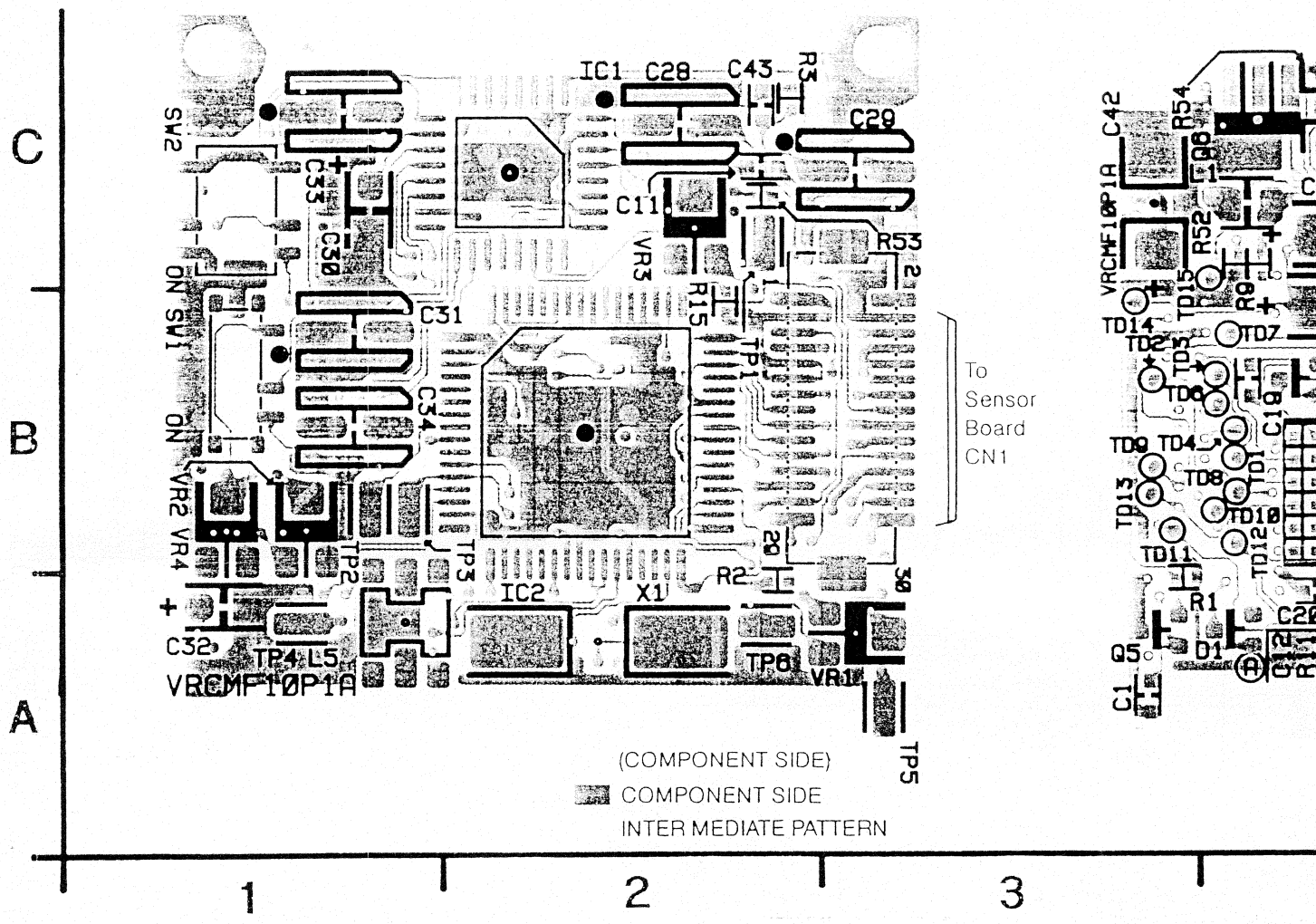
CONDUCTOR VIEW OF PROCESS

Component Side

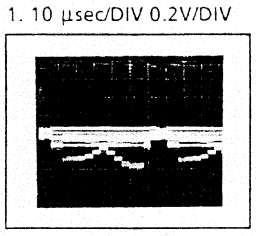
IC1	C2
IC2	B2

Pattern Side

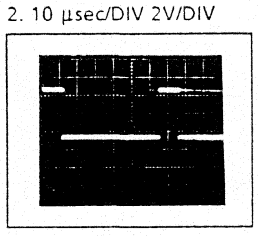
IC3	A5
Q1	A5
Q2	C5
Q3	B5
Q4	C5
Q5	A3
Q6	C4
D1	A4
D2	B4
D3	A5
D4	A5
D5	B5



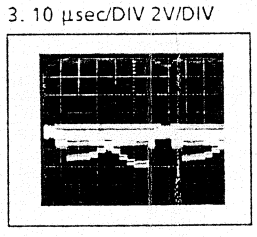
1. 10 µsec/DIV 0.2V/DIV



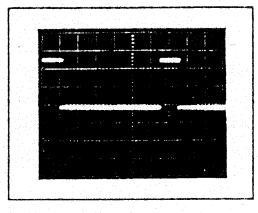
2. 10 µsec/DIV 2V/DIV



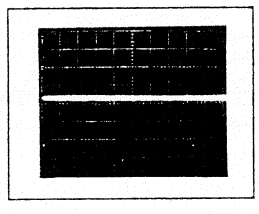
3. 10 µsec/DIV 2V/DIV



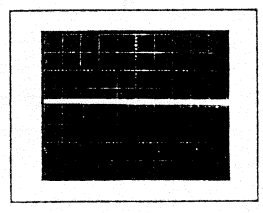
4. 10 µsec/DIV 2V/DIV



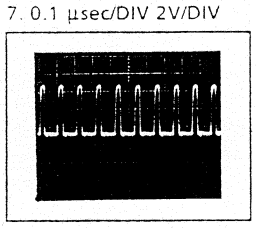
5. 2 msec/DIV 2V/DIV



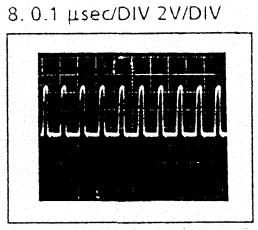
6. 2 msec/DIV 2V/DIV



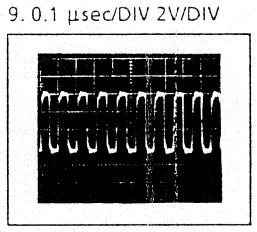
7. 0.1 µsec/DIV 2V/DIV



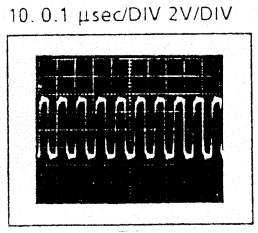
8. 0.1 µsec/DIV 2V/DIV



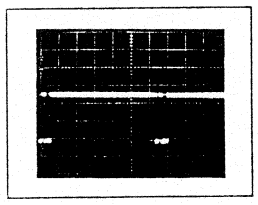
9. 0.1 µsec/DIV 2V/DIV



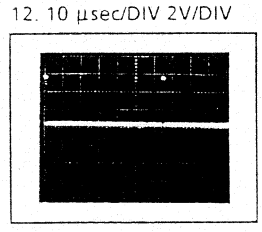
10. 0.1 µsec/DIV 2V/DIV



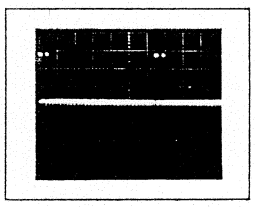
11. 10 µsec/DIV 2V/DIV



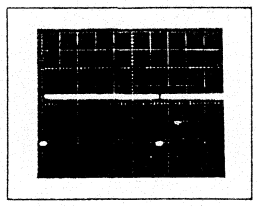
12. 10 µsec/DIV 2V/DIV



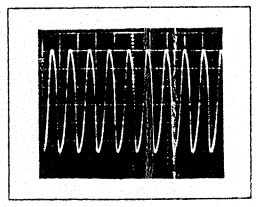
13. 10 µsec/DIV 2V/DIV



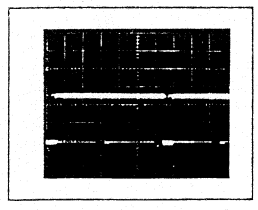
14. 10 µsec/DIV 2V/DIV



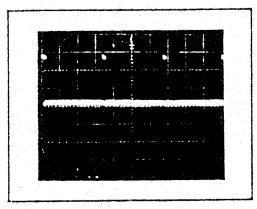
15. 50 nsec/DIV 1V/DIV



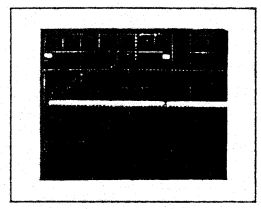
16. 10 µsec/DIV 2V/DIV



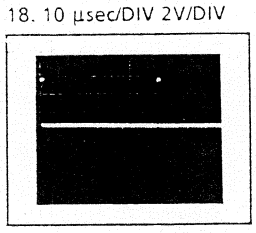
21. 5 msec/DIV 2V/DIV



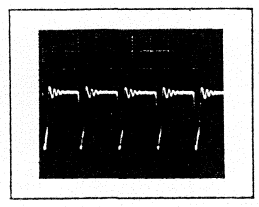
17. 10 µsec/DIV 2V/DIV



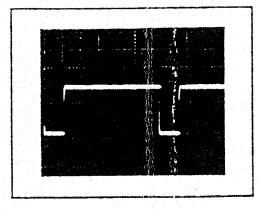
18. 10 µsec/DIV 2V/DIV



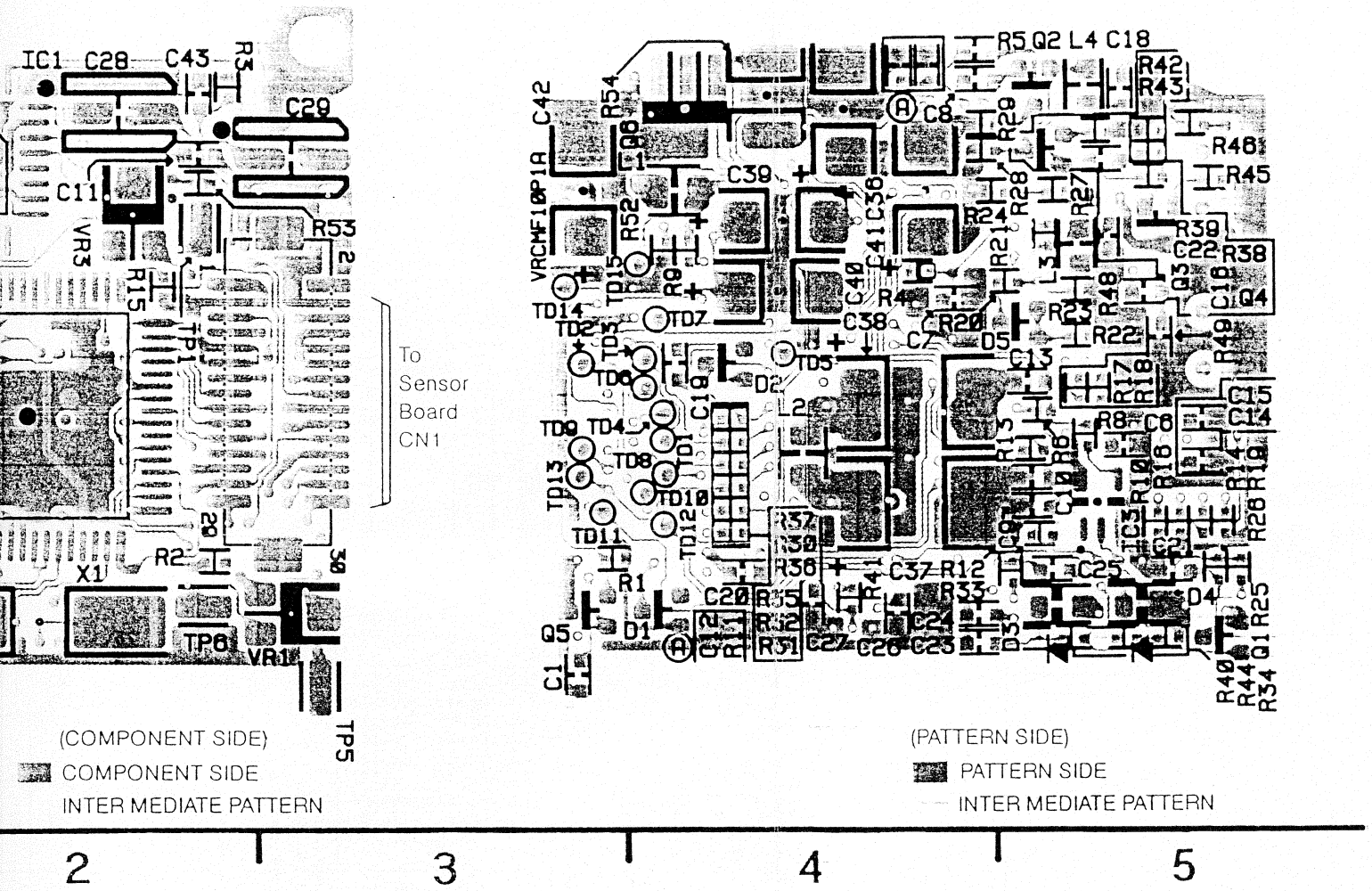
19. 50 nsec/DIV 2V/DIV



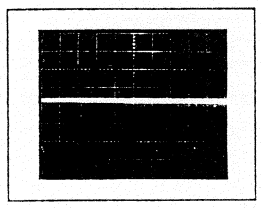
20. 10 µsec/DIV 2V/DIV



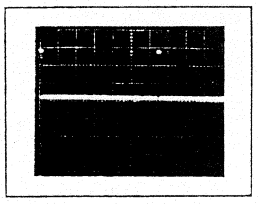
CONDUCTOR VIEW OF PROCESS BOARD



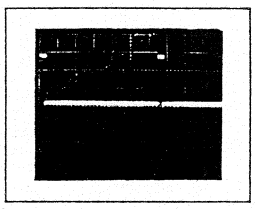
6. 2 msec/DIV 2V/DIV



12. 10 µsec/DIV 2V/DIV



17. 10 µsec/DIV 2V/DIV



Process Board

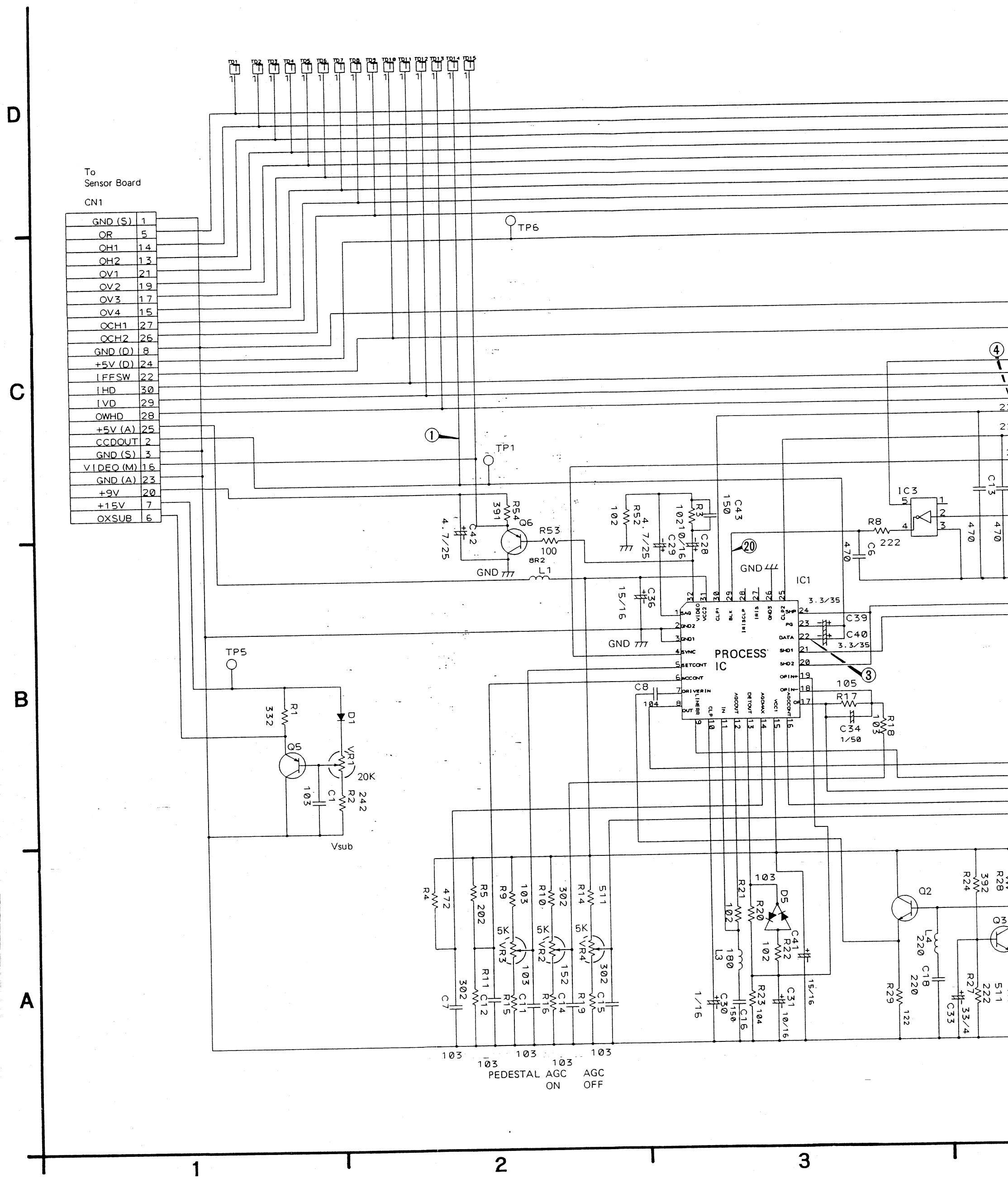
Pin	IC1	IC3	IC2
1	2.1	2.0	0.0
2	0.0	1.2	0.0
3	0.0	0.0	5.0
4	4.6	3.8	5.0
5	2.5	5.0	0.0
6	3.0		0.0
7	3.1		0.2
8	2.4		1.1
9	2.2		0.1
10	3.0		0.2
11	2.7		0.2
12	2.7		0.8
13	2.2		1.2
14	5.0		4.6
15	5.0		0.0
16	3.7		5.1
17	4.8		5.1
18	1.9		0.0
19	1.9		0.0
20	1.2		0.0
21	1.2		2.4
22	3.0		2.0
23	2.9		5.0
24	1.2		0.0
25	0.2		0.0
26	0.0		0.0
27	1.3		5.0
28	2.5		5.0
29	3.8		2.5
30	0.1		2.4
31	5.0		2.6
32	2.7		5.0

Pin	IC2
33	0.0
34	1.2
35	1.2
36	5.0
37	2.2
38	2.7
39	0.0
40	2.1
41	1.6
42	4.2
43	0.0
44	0.0
45	4.6
46	0.2
47	4.8
48	0.2
49	5.0
50	5.0
51	5.0
52	0.0
53	0.0
54	0.0
55	0.0
56	5.1
57	5.1
58	0.0
59	0.0
60	0.0
61	0.0
62	0.0
63	0.0
64	5.0

	B	C	E
Q1	(G)0.0	(D)5.0	(S)0.3
Q2	1.8	2.4	1.5
Q3	1.7	3.7	1.1
Q4	2.3	5.0	1.7
Q5	6.4	0.0	7.0
Q6	2.4	0.0	3.1

GPMF102
Panasc
(11-16)

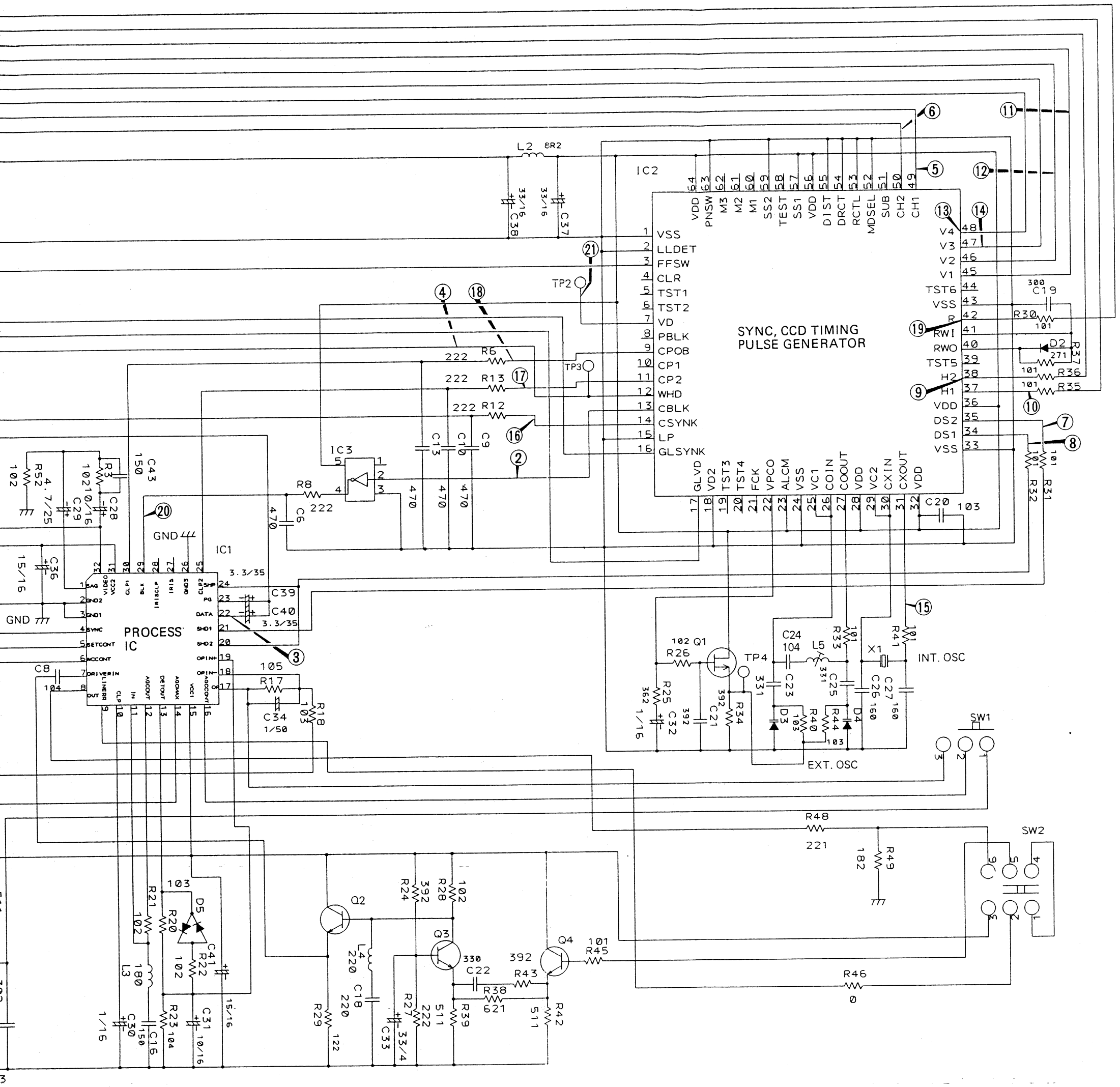
SCHEMATIC DIAGRAM OF PROCESS BO



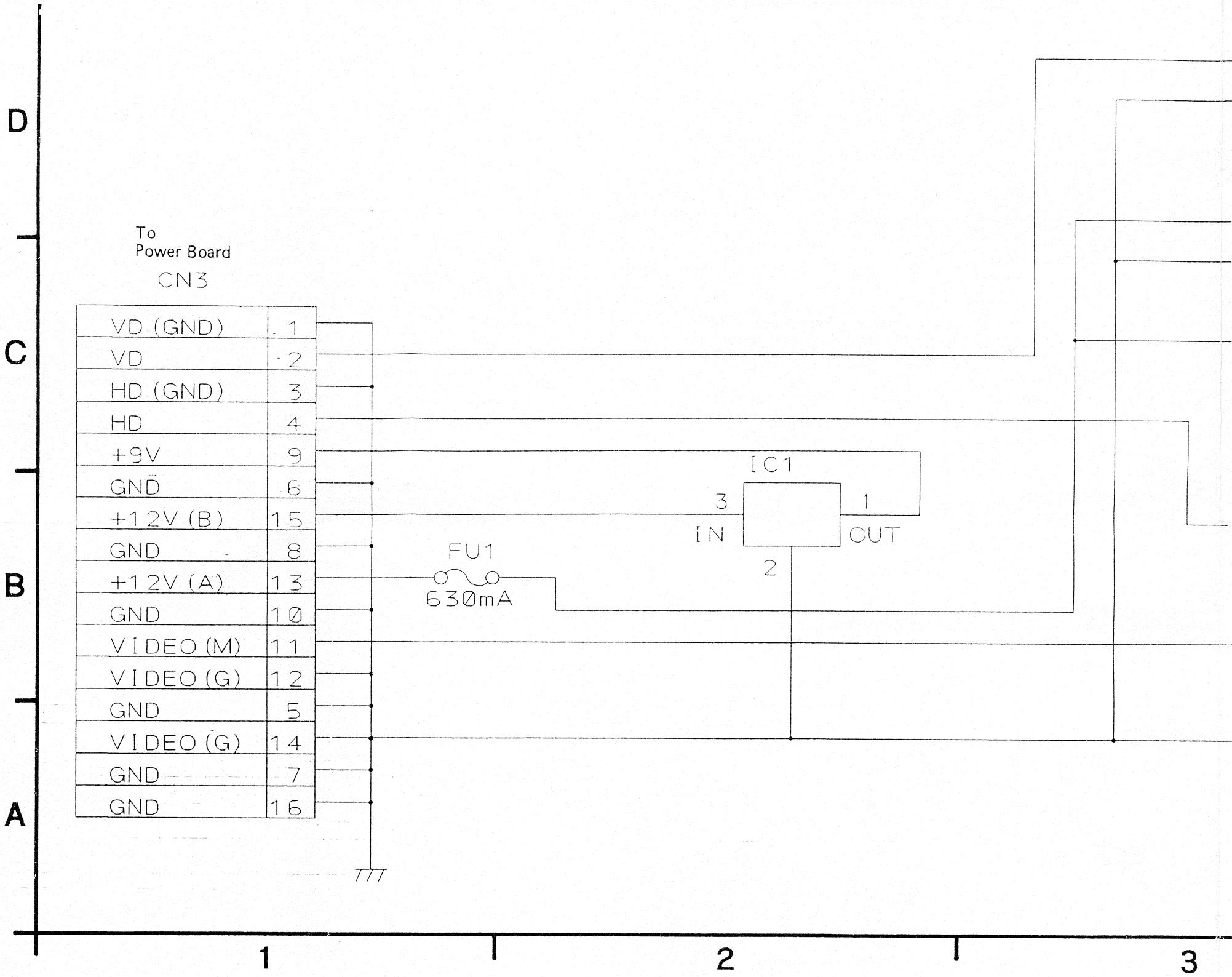
Process Board

IC1	B3	Q1	B4	D1	B2
IC2	C5	Q2	A3	D2	C5
IC3	C4	Q3	A4	D3	B5
		Q4	A4	D4	B5
		Q5	B1	D5	A3
		Q6	B2		

SCHEMATIC DIAGRAM OF PROCESS BOARD



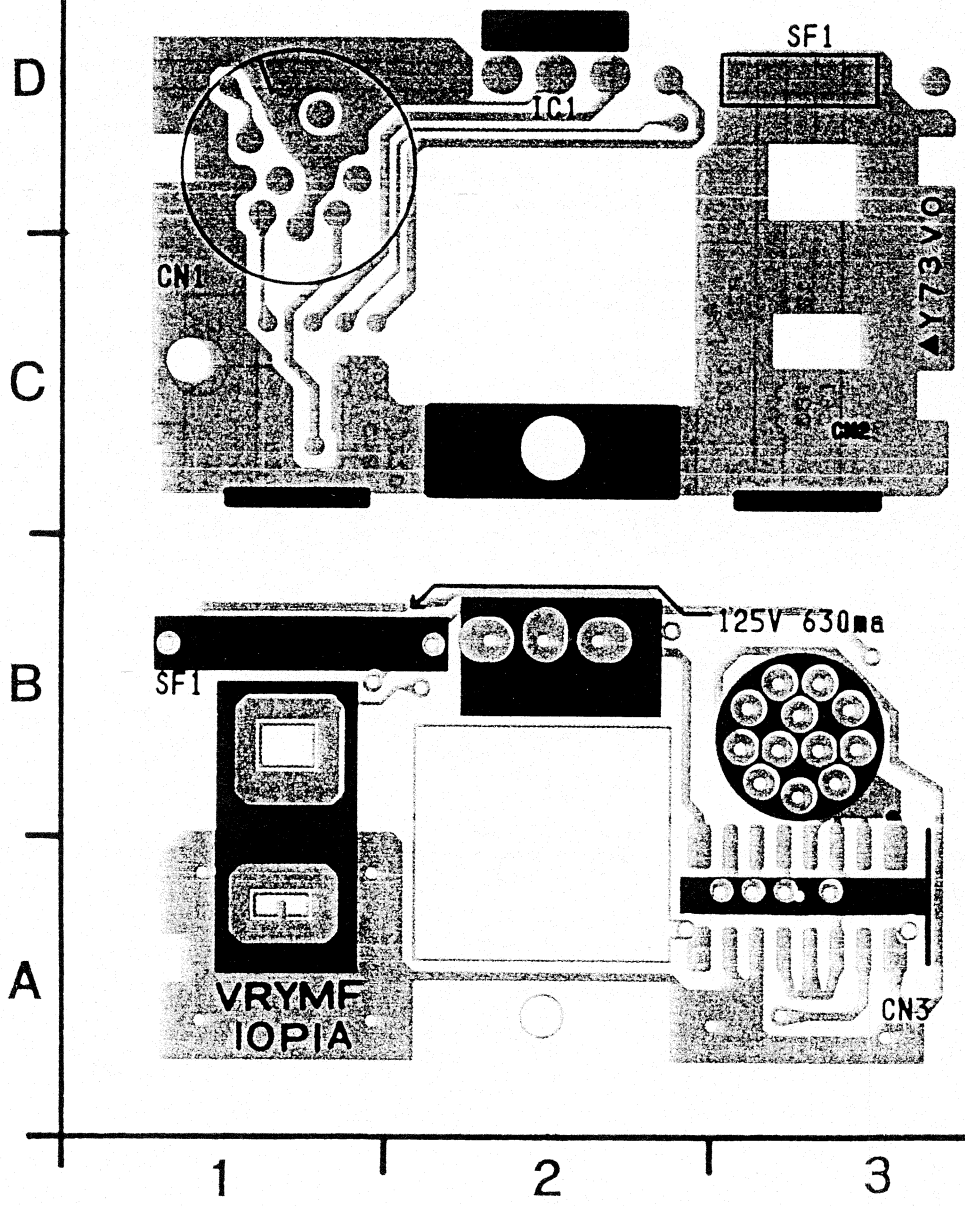
SCHEMATIC DIAGRAM OF REAR BOARD



Rear Board

IC1 B2

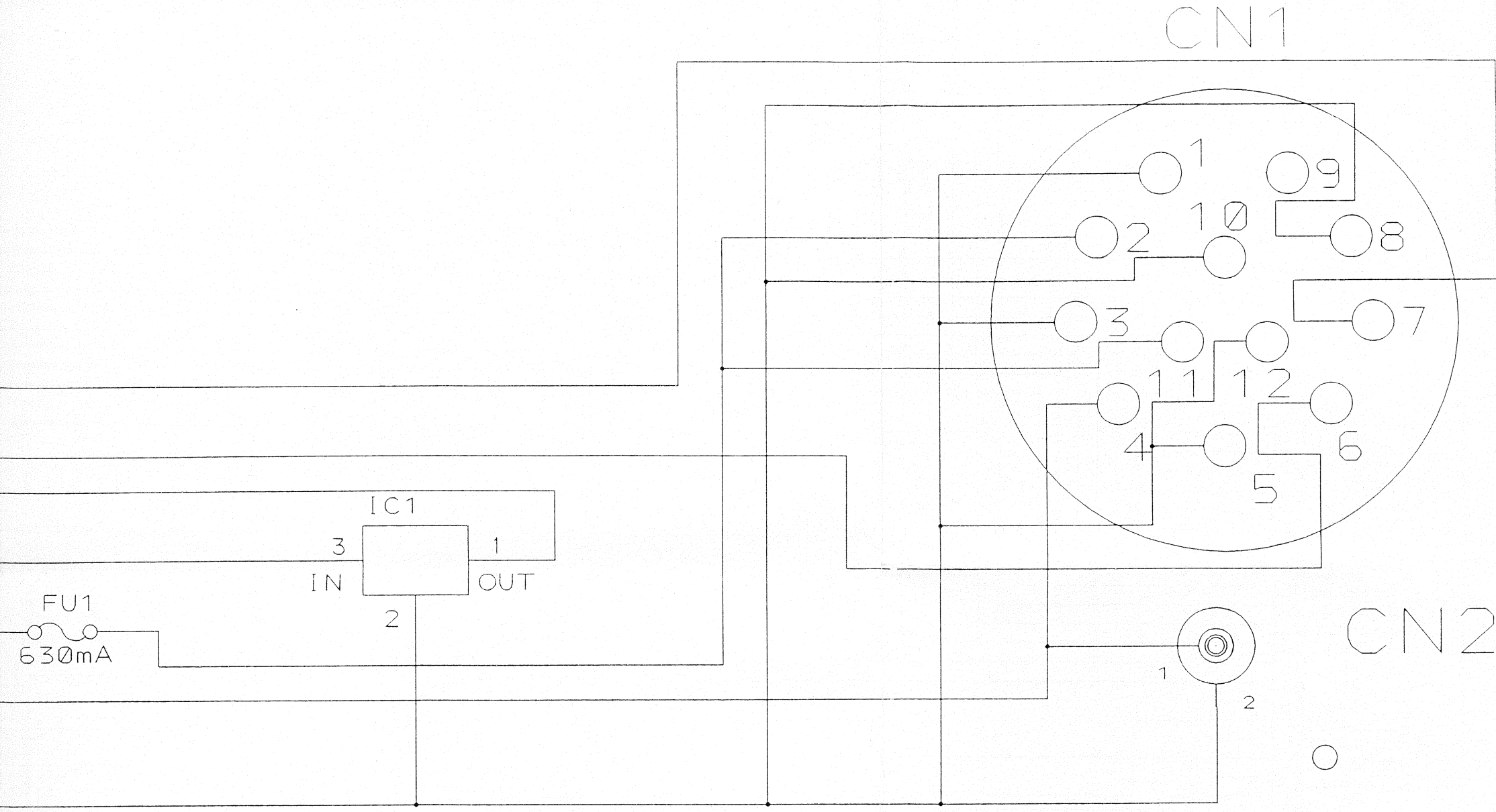
CONDUCTOR VIEW OF REAR BOARD



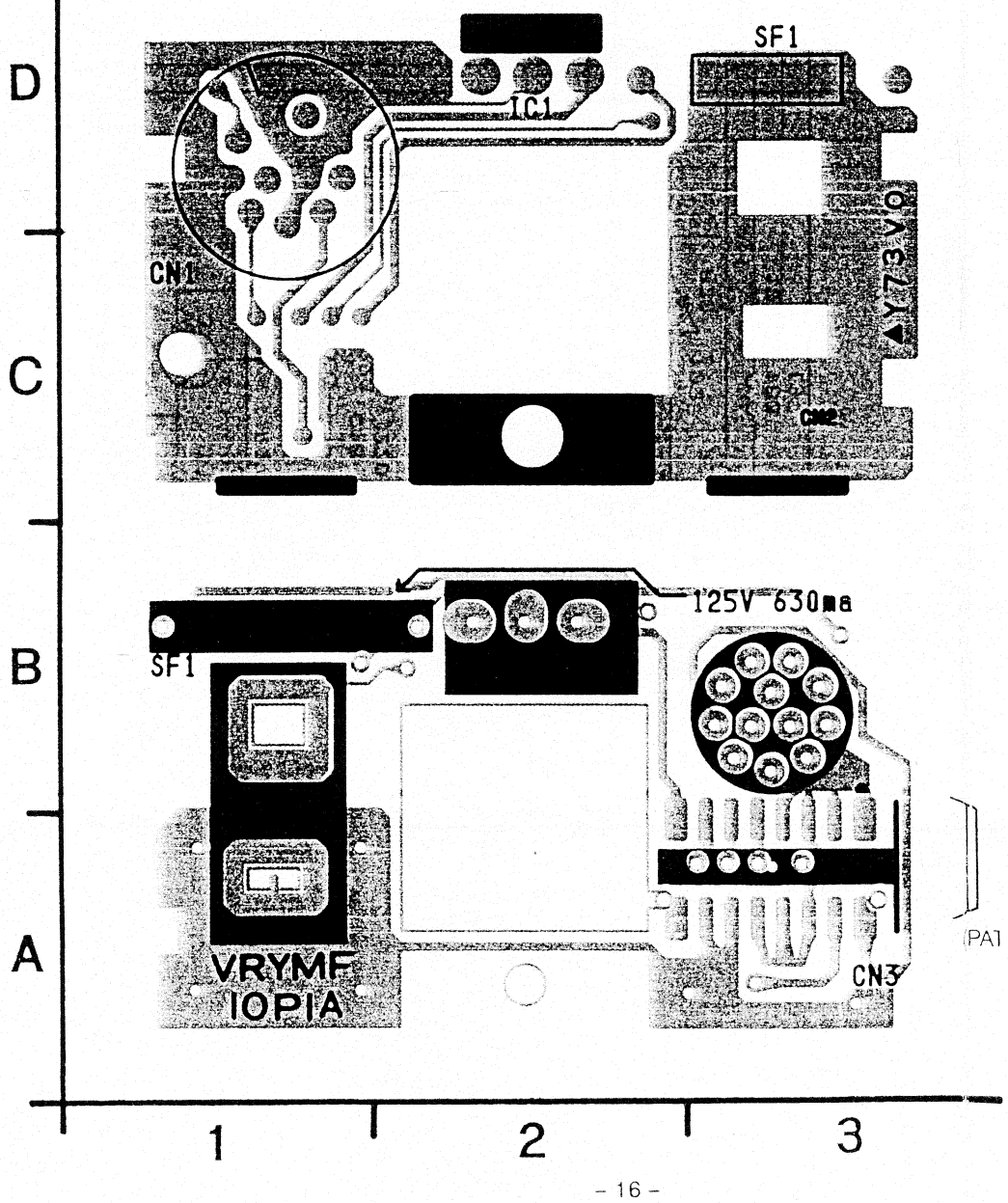
Component Side

IC1 D2

SCHEMATIC DIAGRAM OF REAR BOARD



CONDUCTOR VIEW OF REAR BOARD

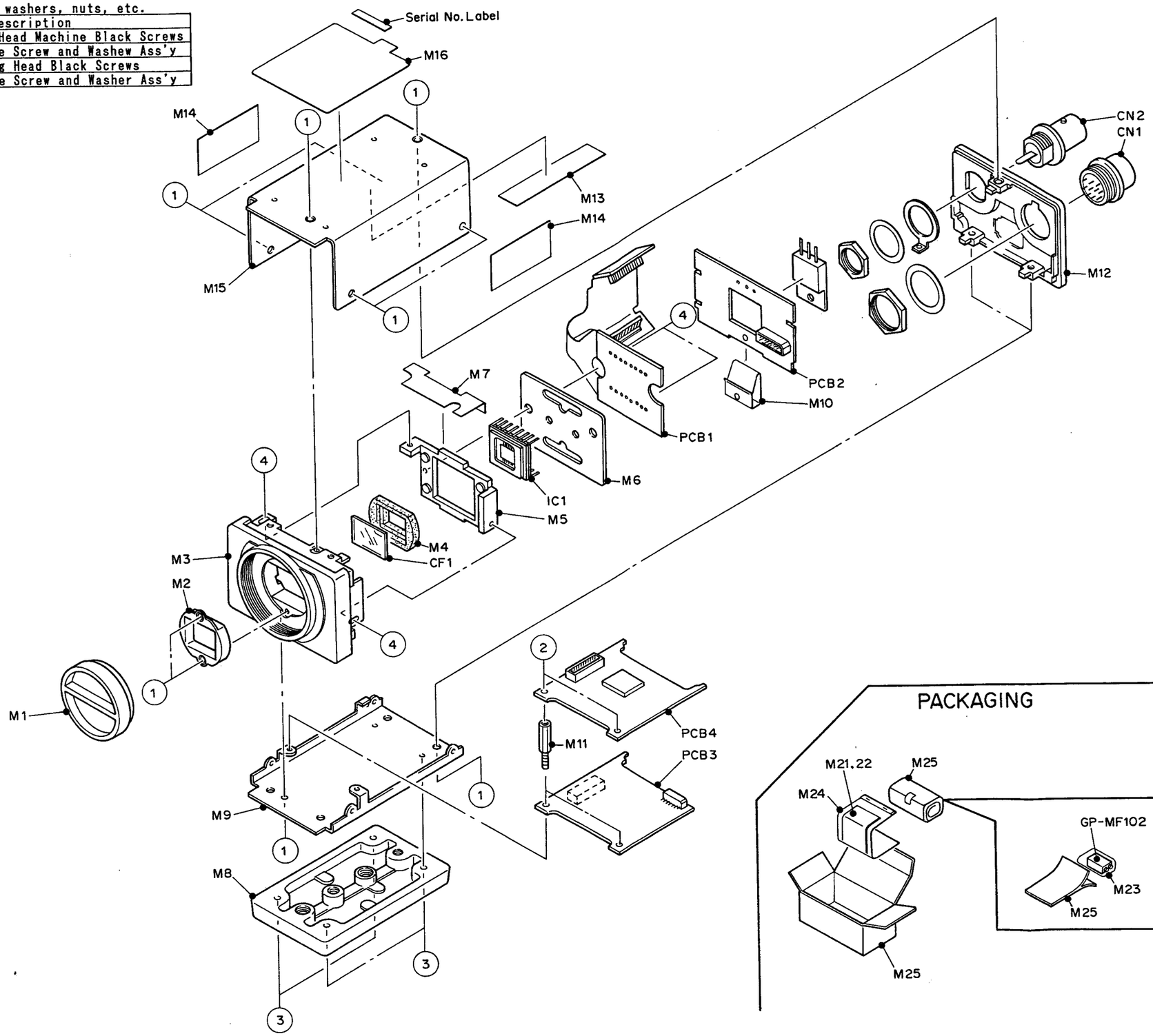


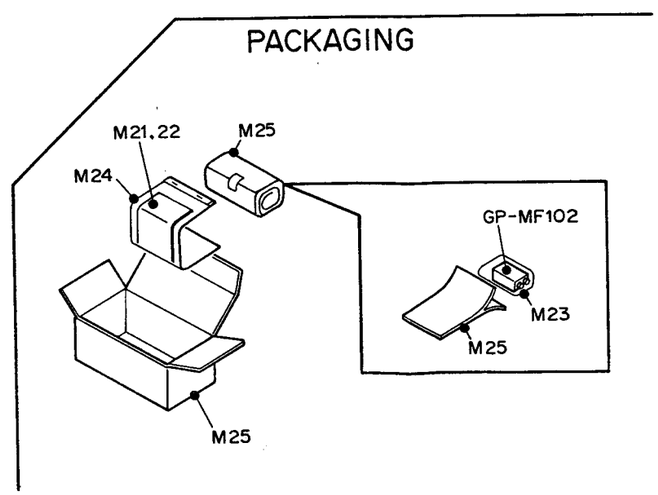
Component Side
IC1 D2

EXPLODED VIEW

○ Numbers show screws, washers, nuts, etc.

No.	Screws	Description
①	XSS2+4FXK	Flush Head Machine Black Screws
②	XYN2+J5FN	Machine Screw and Washew Ass'y
③	XSB2+6FXK	Binding Head Black Screws
④	XYN2+B4FX	Machine Screw and Washer Ass'y





REPLACEMENT PARTS LIST

Important Notice

1. Components identified by "⚠" mark have special characteristics important for safety.
   When replacing any of these components, use only manufacturer's specified parts.
2. RTL : Retention Time Limited,

MISCELLANEOUS

REF.NO.	PART NO.	DESCRIPTION
IC1	MN3716AC	Image Sensor
CF1	YWIRC900X135	Filter
CN1	HR10A10R12PB	12-pin Connector
CN2	YWHXC0325900	BNC Connector
M1	YWBC-2B	Body Cap
M2	YWV2CA0218A4	Hold Plate
M3	YWV5BA0100A3	Front Escutcheon
M4	YWV2FA0612A4	IR Cushion
M5	YWV6FA0156A4	Mounting Bracket
M6	YWV2TA0316A4	Mounting Base
M7	YWV5EA1239A4	Mounting Cover
M8	YWV2TB0131A3	Mounting Bracket
M9	YWV5EA1238A3	Bottom Cover
M11	YWBSB2010	Stud
M12	YWV5BA0049A3	Rear Escutcheon
M13	YWV7MA0270A4	Fuse Caution Label
M14	YWV7QA2934A4	Side Label
M15	YWV5EA1237A3	Upper Cover
M16	YWV7QA2933A4	Main Label

SENSOR BOARD

REF.NO.	PART NO.	DESCRIPTION	
PCB1 (RTL)	YWVKZMF10P1A	Printed Circuit Board Assy	
Q1	2SC3735	Transistor	
Q2	2SA1462	Transistor	
Q3	2SK662-PQR	FET	
D1,2	MA141K	Diode	
R1	ERJ3GEYJ101	Carbon	100 ohms 1/16W
R2	ERJ3GEYJ510	Carbon	51 ohms 1/16W
R3	ERJ3GEYJ100	Carbon	10 ohms 1/16W
R4	ERJ3GEYJ392	Carbon	3.9K ohms 1/16W
R5-7	ERJ3GEYJ101	Carbon	100 ohms 1/16W
R8	ERJ3GEYJ103	Carbon	10K ohms 1/16W
C1	YW5CH330J5VB	Ceramic	33 pF
C2	YW5F473Z2VB	Ceramic	0.047 µF
C3	YW5CH470J5VB	Ceramic	47 pF
C4	YW5F473Z2VB	Ceramic	0.047 µF
C5	YW5F104Z2VB	Ceramic	0.1 µF
C6	YW5F473Z2VB	Ceramic	0.047 µF
C7	ECST1VD106	Tantalum	10 µF 35V
C8	YF400104FZT	Ceramic	0.1 µF
C9	ECST1EB335	Tantalum	3.3 µF 25V
L1	ELJFC8R2MF	Coil	8.2 µH
CN1,2	YWTKCZ30PA1	30-pin Connector	

REAR BOARD

PCB2 (RTL)	YWVKYMF10P1A	Printed Circuit Board Assy
IC1	NJM7809A	IC
CN3	YW41756436	16-pin Connector
F1	SSFR630F002	Current Fuse 0.63A
M10	YWV2CA0370A4	Hold Plate

POWER BOARD

REF.NO.	PART NO.	DESCRIPTION	
PCB3 (RTL)	YWVKBMF10P1A	Printed Circuit Board Assy	
IC1	YWMC74HC242F	IC	
IC2	YWUPD16501GS	IC	
IC3	YWNJM78L05UA	IC	
IC4-7	YWTC7S04F	IC	
Q1,2	2SC4081	Transistor	
Q4	2SD601A-QR	Transistor	
Q8	2SB709-QRS	Transistor	
Q9	2SD601-RS	Transistor	
D5,6	MA141K	Diode	
D8,9	MA143	Diode	
D11	MA153	Diode	
D12,13	YWRB421D	Diode	
D14,15	MA151K	Diode	
D16	MA143	Diode	
R2,3	ERJ2GEJ390	Carbon	39 ohms 1/16W
R5	ERJ2GEJ821	Carbon	820 ohms 1/16W
R6	ERJ2GEJ432	Carbon	4.3K ohms 1/16W
R7	ERJ2GEJ103	Carbon	10K ohms 1/16W
R8	ERJ2GEJ680	Carbon	68 ohms 1/16W
R9	ERJ2GEJ181	Carbon	180 ohms 1/16W
R10	ERJ2GEJ103	Carbon	10K ohms 1/16W
R11,12	ERJ2GEJ153	Carbon	15K ohms 1/16W
R13	ERJ2GE0R00	Carbon	0 ohms 1/16W
R14	ERJ2GEJ561	Carbon	560 ohms 1/16W
R15	ERJ2GEJ752	Carbon	7.5K ohms 1/16W
R16	ERJ2GEJ393	Carbon	39K ohms 1/16W
R17	ERJ2GEJ124	Carbon	120K ohms 1/16W
R18	ERJ2GEJ511	Carbon	510 ohms 1/16W
R19	ERJ2GEJ102	Carbon	1K ohms 1/16W
R20	ERJ2GEJ473	Carbon	47K ohms 1/16W
R21	ERJ2GEJ750	Carbon	75 ohms 1/16W
R22	ERJ2GEJ511	Carbon	510 ohms 1/16W
R23	ERJ2GEJ124	Carbon	120K ohms 1/16W
R25	ERJ2GEJ750	Carbon	75 ohms 1/16W
R26,28	ERJ2GEJ102	Carbon	1K ohms 1/16W
R29	ERJ12YJ150	Carbon	15 ohms 1/16W
R32	ERJ2GEJ620	Carbon	62 ohms 1/16W
R33	ERJ2GEJ100	Carbon	10 ohms 1/16W
C2-4	YW360F103Z50	Ceramic	0.01 µF
C8	YW360F103Z50	Ceramic	0.01 µF
C9	ECST1CC106	Electrolytic	10 µF 16V
C10	YW360F103Z50	Ceramic	0.01 µF
C11	ECST1VC335	Electrolytic	3.3 µF 35V
C12	YW360F103Z50	Ceramic	0.01 µF
C13	ECEV0JV220	Electrolytic	22 µF 6.3V
C17	ECEV1CV470	Electrolytic	47 µF 16V
C19	ECST1EB335	Electrolytic	3.3 µF 25V
C20,21	ECEV1CV470	Electrolytic	47 µF 16V
C22	ECEV1CV100	Electrolytic	10 µF 16V
C24	ECEV1EV6R8	Electrolytic	6.8 µF 25V
C28,29	ECST1CC156	Tantalum	15 µF 16V
C30	YW360F103Z50	Ceramic	0.01 µF
C31	ECST1VD106	Tantalum	10 µF 35V
C32,33	ECEV1CV100	Electrolytic	10 µF 16V
C34	ECEV1CV220	Electrolytic	22 µF 16V
C35	ECEV1CV100	Electrolytic	10 µF 16V
C36,37	ECEV1CV470	Electrolytic	47 µF 16V
C38	ECST1VY224Z	Tantalum	0.22 µF 35V
C39	ECST1VY104	Tantalum	0.1 µF 35V
C41	ECEV0GV221	Electrolytic	220 µF 4V
L4,5	ELJFA101KB	Coil	100 µH
L6	ELJFA151KB	Coil	150 µH
SW3	YWSSSS822A	Slide Switch	
SW4	YWSSSS812B12	Slide Switch	
CN1	YWTKCZ30XA1	Connector	
CN2	YW41756396	Connector	
TP6	YWRCS3216TPV	Test -pin	

PROCESS BOARD

REF.NO.	PART NO.	DESCRIPTION	
PCB4 (RTL)	VKCMF10P1A		
IC1	YWCXA1310AQ	IC	
IC2	MN5168	IC	
IC3	YWTC7S04F	IC	
Q1	2SK662-PQR	FET	
Q2-4	2SC4081	Transistor	
Q5	2SA1576	Transistor	
Q6	2SA1737	Transistor	
D1,2	MA141K	Diode	
D3,4	MA372	Diode	
D5	MA143	Diode	
R1	ERJ2GEJ332	Carbon	3.3K ohms 1/16W
R2	ERJ2GEJ242	Carbon	2.4K ohms 1/16W
R3	ERJ2GEJ102	Carbon	1K ohms 1/16W
R4	ERJ2GEJ472	Carbon	4.7K ohms 1/16W
R5	YWR0816P202D	Metal	2K ohms 1/16W
R6,8	ERJ2GEJ222	Carbon	2.2K ohms 1/16W
R9	ERJ2GEJ103	Carbon	10K ohms 1/16W
R10	ERJ2GEJ302	Carbon	0 ohms 1/16W
R11	YWR0816P302D	Metal	3K ohms 1/16W
R12,13	ERJ2GEJ222	Carbon	2.2K ohms 1/16W
R14	ERJ2GEJ511	Carbon	510 ohms 1/16W
R15	ERJ2GEJ103	Carbon	10k ohms 1/16W
R16	ERJ2GEJ152	Carbon	1.5K ohms 1/16W
R17	ERJ2GEJ105	Carbon	1M ohms 1/16W
R18	ERJ2GEJ103	Carbon	10K ohms 1/16W

VIDE-V27693 / DRUCK: 6

REF.NO.	PART NO.	DESCRIPTION
R19	ERJ2GEJ302	Carbon 3K ohms 1/16W
R20	ERJ2GEJ103	Carbon 10K ohms 1/16W
R21,22	ERJ2GEJ102	Carbon 1K ohms 1/16W
R23	ERJ2GEJ104	Carbon 100K ohms 1/16W
R24	ERJ2GEJ392	Carbon 3.9K ohms 1/16W
R25	ERJ2GEJ362	Carbon 3 6K ohms 1/16W
R26	ERJ2GEJ102	Carbon 1K ohms 1/16W
R27	ERJ2GEJ222	Carbon 2.2K ohms 1/16W
R28	ERJ2GEJ102	Carbon 1K ohms 1/16W
R29	ERJ2GEJ122	Carbon 1.2K ohms 1/16W
R30-33	ERJ2GEJ101	Carbon 100 ohms 1/16W
R34	ERJ2GEJ392	Carbon 3.9K ohms 1/16W
R35,36	ERJ2GEJ101	Carbon 100 ohms 1/16W
R37	ERJ2GEJ271	Carbon 270 ohms 1/16W
R38	ERJ2GEJ621	Carbon 620 ohms 1/16W
R39	ERJ2GEJ511	Carbon 510 ohms 1/16W
R40	ERJ2GEJ103	Carbon 10K ohms 1/16W
R41	ERJ2GEJ101	Carbon 100 ohms 1/16W
R42	ERJ2GEJ511	Carbon 510 ohms 1/16W
R43	ERJ2GEJ392	Carbon 3.9K ohms 1/16W
R44	ERJ2GEJ103	Carbon 10K ohms 1/16W
R45	ERJ2GEJ101	Carbon 100 ohms 1/16W
R46	ERJ2GE0R00	Carbon 0 ohms 1/16W
R48	YWR0816P221D	Metal 220 ohms 1/16W
R49	YWR0816P182D	Metal 1 8K ohms 1/16W
R52	ERJ2GEJ102	Carbon 1K ohms 1/16W
R53	ERJ2GEJ100	Carbon 10 ohms 1/16W
R54	ERJ14YJ391	Carbon 390 ohms 1/16W
VR1	EVM7JGA30B24	Variable Resistor 20K ohms
VR2-4	EVM7JGA30B53	Variable Resistor 5K ohms
C1	YW5X103K2VB	Ceramic 0.01 µF
C6	YW5CH470J5VB	Ceramic 47 pF
C7	YW5F103Z5VB	Ceramic 0.01 µF
C8	YW5F104Z2VB	Ceramic 0 1 µF
C9,10	YW5CH470J5VB	Ceramic 47 pF
C11,12	YW5F103Z5VB	Ceramic 0.01 µF
C13	YW5CH470J5VB	Ceramic 47 pF
C14,15	YW5F103Z5VB	Ceramic 0.01 µF
C16	YW5CH150J5VB	Ceramic 15 pF
C18	YW5CH220J5VB	Ceramic 22 pF
C19	YW5CH300J5VB	Ceramic 30 pF
C20	YW5F103Z5VB	Ceramic 0.01 µF
C21	YW5X392K5VB	Ceramic 3900 pF
C22	YW5CH330J5VB	Ceramic 33 pF
C23	YW5CH331J5VB	Ceramic 330 pF
C24	YW5F104Z2VB	Ceramic 0 1 µF
C25	YW5CH331J5VB	Ceramic 330 pF
C26,27	YW5CH160J5V	Ceramic 16 pF
C28	ECEV1CV100	Electrolytic 10 µF 16V
C29	ECEV1EV4R7	Electrolytic 4 7 µF 25V
C30	ECST1CY105	Tantalum 1 µF 16V
C31	ECEV1CV100	Electrolytic 10 µF 16V
C32	ECST1CY105	Tantalum 1 µF 16V
C33	ECEV0JV330	Electrolytic 33 µF 6.3V
C34	ECEV1HN010SR	Electrolytic 1 µF 50V

REF.NO.	PART NO.	DESCRIPTION
C36	ECST1CC156	Tantalum 15 µF 16V
C37,38	ECST1CD336	Tantalum 33 µF 16V
C39,40	ECST1VC335	Tantalum 3.3 µF 35V
C41	ECST1CC156	Tantalum 15 µF 16V
C42	ECST1EC475	Tantalum 4.7 µF 25V
C43	YW5CH150J5VB	Ceramic 15 pF
L1,2	ELJFC8R2MF	Coil 8 2 µH
L3	F2012C180KT	Coil 18 µH
L4	F2012C220KT	Coil 22 µH
L5	EIC4EN006E	Coil
SW1	YWSSSS812B12	Slide Switch
SW2	YWSSSS822A	Slide Switch
X1	YWDX19R066	Crystal Oscillator
CN1	YWTKCZ30XA1	30-pin Connector
TP1-6	YWRCT2125TPV	Test Point

ACCESSORY PARTS/PACKAGING PARTS

M21	YWV8QA2917AN	Operating Instructions
M22	YW-FP10	Service Parts
M23	YWT15X20C03	Polyethylene Bag
M24	YWT20X35C03	Polyethylene Bag
M25	YWV9CA1936AN	Packaging Assy